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DIESEL RAILWAY TRACTION SUPPLEMENT

The May issue of THE RAILWAY GAZETTE *Supplement, illustrating and describing developments in Diesel Railway Traction, is now ready, price* 1*s.*

TO CALLERS AND TELEPHONERS

Until further notice our office hours are: Mondays to Fridays, 9.30 a.m. till 5.30 p.m.
The office is closed on Saturdays

ANSWERS TO ENQUIRIES

By reason of staff shortage due to enlistment, we regret that it is no longer possible for us to answer enquiries involving research, or to supply dates when articles appeared in back numbers, either by telephone or by letter

ERRORS, PAPER, AND PRINTING

Owing to shortage of staff and altered printing arrangements due to the war, and less time available for proof reading, we ask our readers' indulgence for typographical and other errors they may observe from time to time, also for poorer paper and printing compared with pre-war standards

The Progress of Nationalisation

THE Bill for the nationalisation of Cable & Wireless Limited is the third under which the Government is advancing its policy of State ownership of major industrial organisations. The first was the Bank of England Bill, and the second the Coal Industry Bill. The latest of these measures gives some indication of the Government's ideas as to how the amount of compensation for a nationalised undertaking should be determined. In the case of Cable & Wireless Limited this is to be the net maintainable revenue, multiplied by a number of years' purchase; in default of agreement it will be fixed by a tribunal, consisting of a judge, an accountant, and a business man, appointed by the Governor of the Bank of England. No mention is made of the stock payable by the Treasury for the acquisition of Cable & Wireless Limited being non-marketable, as in the case of the Coal Bill. Sir Edward Wilshaw, Chairman & Managing Director of Cable & Wireless Limited, has made strong adverse comment on the Bill, and has suggested the appointment of a Royal Commission to examine the whole subject. He said that the company could not visualise how an international undertaking could be nationalised without serious danger to the interests which it held in foreign countries. If these interests were lost, the whole British cable system would disintegrate, affecting not only the cables to foreign countries, but the main cables linking the Dominions and India with the United Kingdom.

* * * *

The Rise in Exports

British exports during March totalled £67,058,000, which was £7,073,000 more than for the shorter month of February. On a uniform basis of the number of days in each month the rate of exports in the first three months of this year have been respectively £55,000,000, £65,000,000 and £67,000,000. It is provisionally estimated that the volume of March exports, allowing for the rise in prices, was about 88 per cent. of the 1938 level. For the first quarter of the current year total exports amounted to £184,171,000, compared with £73,043,000 for the first quarter of last year, and the 1946 figure is estimated to be equal to 81 per cent. of the 1938 rate in volume. The best showing among the export trades is made by the engineering, vehicle, electrical and chemical industries. An increase of over £2,000,000 in the value of vehicle exports puts that group second in importance only to machinery. Iron and steel exports in the first quarter of the year show an increase of 75 per cent. above the 1938 level.

* * * *

Exports of Railway Products

Railway products have made a substantial contribution to the increase in our export trade. The total number of main-line locomotives exported in the first quarter of this year was 68, of a value of £1,103,550, which compares with only 11 valued at £180,646 in the first three months of 1945, and with 45 worth £394,395 in the first quarter of 1938. The export of wagons in the first quarter of this year has been valued at £629,856, compared with £70,834 a year ago, and with £368,385 in the first quarter of 1938. Parts, including tyres, wheels and axles for locomotives, carriages and wagons, have yielded exports valued at £1,779,727, compared with only £325,092 for the first quarter of last year and with £731,524 for the similar period of 1938. The most important purchaser of British locomotives during the quarter has been the Union of South Africa. To that country 43 locomotives, valued at £889,845, have been shipped.

* * * *

British Railway Investments in Colombia

British investments in the Republic of Colombia never have been large, and the total of the quoted securities on the London Stock Exchange amounts to £7,141,989. The interest received for 1945 was £208,413, or 2.9 per cent., and there was £1,024,420 of capital which received no return. Government bonds totalled £3,908,595, on which the interest was £118,310, or 3 per cent. There are only three British-owned railway undertakings in Colombia. Of these, the Barranquilla Railway & Pier Co. Ltd. no longer owns a railway, which it sold to the Government, and is by way of being a trust company

receiving instalments of the purchase price The Colombia Railways & Navigation Co. Ltd. has ceased all transport operations. Only the Dorada Railway still operates, and in 1945 was able to pay its debenture interest, with 3 per cent. free of tax. The amount of railway capital shown in the statistics compiled by *The South American Journal* was £1,818,531, on which interest of £47,646, or 2.6 per cent., was received. No interest was received on £1,024,420 of capital.

* * * *

Future of Rhodesian Railways

In June, 1945, the Secretary of State for Dominion Affairs appointed Sir Harold Howitt a Commissioner to advise whether it would be in the interests of Northern Rhodesia and the Bechuanaland Protectorate for the equity in Rhodesia Railways Limited to be acquired jointly by the Governments of Southern Rhodesia, Northern Rhodesia and the Bechuanaland Protectorate. Sir Harold Howitt has now presented a detailed report on his conclusions, with which we hope to deal at some length in a future issue. Briefly, his conclusions are that, although Government ownership of these railways is bound to come, because it seems inevitable that the form of ownership should conform ultimately to the other African railway systems, which are predominantly State-owned, he feels that the time for State ownership is not yet. In his view the question of Government acquisition should be deferred for at least five years, during which period the parties concerned should confer. In the report Sir Harold Howitt suggests that some form of transport authority should be set up, charged with the responsibility of representing to the railway company the views and requirements of the territories on vital issues, particularly those concerned with development.

* * * *

Individualism in Industrial Research

The more individualistic a manufacturer is, the more research he must carry out, and a plea for progressive individualism, particularly among small undertakings, was made at the F.B.I. conference by Mr. A. Healey, whose paper is given in part elsewhere in this issue. Although to many, the research laboratories provided by the larger concerns may suggest that industrial research is not for the smaller unit, the smaller concern does compete with the larger one, and there is good reason for its relative success. The research worker in a smaller unit, in collaboration with a broadminded manager, can achieve much in the application of science, and no one realises this better than the management of the large concern, which frequently decentralises its operations to take advantage of it. There must always remain the individual problem, which must be tackled individually. The activities of scientific workers, although in the first instance they may be engaged mainly on known problems, will soon bring to light new problems and new possibilities.

* * * *

Cook's Pond Viaduct, East Grinstead

Between April 13 and 23, the Southern Division of the Chief Civil Engineer's Department of the Southern Railway undertook the strengthening of the lattice girder viaduct of five spans at Cook's Pond, between Dormans and East Grinstead, to give improved support to the up line. At the same time, the longitudinal timbers and decking of the up line were renewed. To enable all traffic to be worked over the down line, facing connections were laid in at each end of the viaduct, and the single-line section was controlled by stop signals worked from a temporary signal box. The motors of the points were actuated by a hand-operated generator. After the removal of the track and the old longitudinal timbers, additional cross bearers were welded into position, and the new timbers and decking were laid. The track was then restored, and normal working resumed. Although the railway carries a fairly heavy traffic at certain hours of the day, and the occupation extended over the Easter holiday period, the work was carried out without a hitch, and with no more than trifling alterations to a few trains. The down line was dealt with in a similar way last year, but on that occasion single-line working was in force between Lingfield and St. Margaret's Junction, East Grinstead, a distance of nearly 3¼ miles.

Kingwood Tunnels, B. & O.RR.

In connection with the article on page 487, describing an unusual method adopted for relining a tunnel, it may be of interest to note that construction of the original single-line Kingwood tunnel at Tunnelton, West Virginia, was begun as long ago as 1849 and was completed in 1857. This tunnel, which is still in use, is built on a gradient of 1 in 50 rising to the summit at its eastern portal. Ventilation in it is restricted by the size of modern motive power, and nowadays, therefore, it is normally used only for westbound or descending traffic. It was supplemented in 1910 by the opening of the double-line parallel tunnel, about 1,580 ft. long, but here the summit is midway through the tunnel, the line falling thence at 1 in 50 towards each portal. Smoke conditions are particularly bad in this tunnel because of the large number of very heavy trains using it, and due to the correspondingly heavy blast of the Mallet articulated locomotives labouring up such severe gradients. The replacement of 528 ft. of the damaged brick arch roofing without any work being done in the tunnel itself—apart from the final removal of the 18-year-old shoring—and with no previous disturbance of this shoring or interference in any way with the heavy wartime traffic, and also without fear of rock falls, is of unusual interest. What this work cost is not disclosed.

* * * *

The Cast-Iron Plate Sleeper

In our April 19 issue we published an article on British metal plate sleepers, accompanied by a short editorial article entitled "The Cast-Iron Plate Sleeper." By an error on the part of our printers, the editorial article in its uncorrected form was substituted for the editorial article containing amendments which should have been used, and as a result, a number of errors were contained in the editorial article as published. The article in the form in which it should have appeared made it clear that Guest Keen & Nettlefolds Limited is producing six (not five) types of plate sleeper, and that it claims that these sleepers have lower initial and maintenance costs and double the life of timber sleepers. Five of the six types are suitable for main-line track, and two of these types can be used where track circuiting has been installed. The trials of one of the bull-head steel tie-bar types on the standard gauge Derwent Valley Light Railway near Layerthorpe (not Tayerthorpe as printed) are not, of course, being conducted by the L.M.S.R.

* * * *

Compromise in Track Design

Permanent way design provides many examples of compromise, mainly because optimum operating conditions can seldom be achieved. The superelevation of the outer rail on curves is a noteworthy example, as the ideal degree of superelevation presupposes the passage of all trains at a uniform speed, which is a condition seldom encountered excepting on a few urban electric railways. The design of switches provides similar problems, and this week a correspondent contributes an article in which he outlines his theory that sufficient width of clear flangeway is often not allowed to ensure avoiding contact between the back of a wheel flange and the back of the open switch, particularly with the passage of wheels with badly worn tyres. His attention was first directed to the point at the marshalling yard at Kantara during the first world war, as a result of a derailment and subsequent tests. Our correspondent realises that the condition he discusses has probably been noticed and considered, which of course is the case, but his calculations should prove of value in any further consideration of the problem which may be called for by reduced maintenance conditions of both track and rolling stock, and as such we feel are worthy of being placed on record.

* * * *

Locomotive Limitations

On April 10 the first Sir Seymour Biscoe Tritton Lecture was delivered in London before the Institution of Locomotive Engineers. The lecturer was Mr. Julian S. Tritton, son of the illustrious engineer in whose memory this series of lectures was founded; and certainly no more appropriate choice could have been made. We print an abridged version of the lecture elsewhere in this issue; but in this short account—and indeed

in any transcript—it is impossible to convey the deft, characteristic touches from the personal experience of the speaker or the many shrewd and witty comments, thrown out in passing, during his survey of locomotive limitations. This survey was remarkably comprehensive, covering every form of motive power from the reciprocating steam locomotive to the gas-turbine unit on the Swiss Federal Railways. Protagonists of the former will take comfort from Mr. Tritton's penetrating analysis of the way in which the energy input derived from the coal is distributed, when it is compared with electric traction. But he does present the diesel locomotive as a formidable rival, though he points out that great care is needed in making comparison between diesel and steam power so as to make suitable allowances for first cost, interest, and depreciation charges. Geared steam locomotives also have their attractions, but Mr. Tritton seems to expect most from gas-turbine developments which will permit the use of pulverised coal as fuel.

* * * *

Canadian National Railways

GROSS revenue of the Canadian National Railways for 1945 was $433,773,393, or only 1·7 per cent. below the record figure of $441,147,510 in 1944. The volume of traffic began to decrease slightly in the last three months of the year as a result of the changeover from war conditions to peacetime reconstruction. Operating expenses, at $355,294,048, were 2 per cent. lower, leaving a net operating revenue of $78,479,345, as against $78,600,466. The surplus of $24,756,130, after payment of interest due to the Government and public, compares with $23,026,924 in 1944, an increase of $1,729,206. Average daily earnings remained slightly higher than in 1944 up to the end of September, but subsequently decreased 5·8 per cent. Freight revenue for the whole year was $316,533,329, a decrease of 1·6 per cent., and passenger revenue declined by 6·6 per cent. to $65,199,923. On the other hand there were increases of 6·7 per cent. in express revenues and 3·3 per cent. in other revenues. The express, telegraphs, and hotel departments all experienced the heaviest volume of business in their history. Financial results are compared below:—

	1944 $	1945 $
Freight revenue	321,588,728	316,533,329
Passenger revenue	69,776,257	65,199,923
Total operating revenues	441,147,510	433,773,393
Total operating expenses	362,547,044	355,294,048
Net operating revenue	78,600,466	78,479,345
Net railway operating income	67,724,644	67,877,938
Total income	78,246,826	75,398,791
Deductions from income	7,150,262	4,314,519
Net income available for interest	71,096,564	71,084,272
Interest charges	48,069,639	46,328,142
Cash surplus	23,026,924	24,756,130

In comparing the 1945 operating expenses with those for 1944, it is pointed out that $5,428,000 was included in 1944 for back pay from 1943, whereas there was no similar charge in the year under review. Provision for deferred maintenance in 1945 was $5 million, compared with $10 million in 1944, and equipment depreciation charges amounted to $16,974,000, against $19,853,000, as a result of the adoption in 1945 of a 3½ per cent. depreciation rate, which is the average of the rates used by United States Class 1 railroads. These decreases were partly offset by an increase in unremunerative mileage arising from considerable movement of empty rolling stock to the seaboard for repatriation purposes, and imports of coal from the United States for use on the system. The wages payroll in 1945 was $43,041,000 higher than in 1939, and the cost of materials was approximately $26,350,000 more than in that year. Revenue per ton-mile has decreased from 0·938 cents in 1939 to 0·915 cents in 1945, and revenue per passenger-mile from 2·035 cents to 1·953 cents over the same period. These reductions in average revenue rates are equivalent to a reduction in operating revenue of $10,742,000. Trans-Canada Air Lines carried 17 per cent. more passengers and 11 per cent. more air express in 1945. A trans-Atlantic air express service is in operation, with three flights a week in each direction. Arrangements for a passenger service are well under way.

Construction of the new line from Eastern Junction to Bout de l'Ile on the Island of Montreal was completed and brought into operation in 1945. The new line enables all trains from the Lake St. John and Abitibi area of Northeastern Quebec to come into the Central Station in Montreal, and improves suburban facilities. In addition, it facilitates the transfer of goods traffic in Montreal and shortens routes.

The report, printed throughout on art paper, is bound in a pictorial cover showing troop trains meeting the liner *Queen Elizabeth* at Halifax, and has a frontispiece illustrating some notable bridges on the C.N.R. system. A coloured folding map of the system is included. Certain aspects of financial and statistical trends are shown graphically.

* * * *

The Upper-Quadrant Arm

THE semaphore signal was first applied to railway service in England in 1841 by Sir Charles H. Gregory, Engineer to the Croydon Railway, who modified Pasley's two-arm message-signalling apparatus already in use in the Navy, where it is still seen. Gregory adapted his signal to the time-interval system of train protection: "danger," "caution" and "allright" aspects were given by the horizontal, half-down and vertically-down positions of the arm, with red, green, and white lights to correspond. The arm was built in a slotted post and disappeared at "allright"; no positive signal indication was thought necessary after the full prescribed time interval had elapsed. This was the origin of the lower-quadrant arm movement in Great Britain. With the development of block working three positions of the arm were not required, but the lower-quadrant movement was adhered to, the inclined position serving for "allright." The white light continued to be used for this, for a time, with green at junctions, where extra caution was considered necessary, but eventually was abandoned. The centrally-balanced signal arm of the G.N.R. came later.

Although some of our lines had disc or target types of signal as running signals at one time, these gave place everywhere to the semaphore. In some countries, however, in France especially, they continued in favour, but in most of them as distant signals only; the semaphore was used for other purposes. In France the semaphore was adopted as a distinctive block section signal, and, in conformity with the practice of "effacing" the signals for "allright," was dropped to the post to indicate an unoccupied section. In the German-speaking parts of the Continent, the first signals were really visual telegraphs, for sending messages along the line concerning the traffic (signals to the drivers were made by hand), and to convey all the messages required both quadrants had at times to be used. Eventually, the semaphores became signals as we now understand them, and the upper-quadrant movement was preferred, a practice later followed in countries in close association with Germany. Elsewhere English practice was followed at first, but, eventually, as in the Netherlands and Belgium and on a number of American lines, the upward arm movement obtained favour.

The question—originally intended for a "Question and Answer" meeting—giving rise to Mr. R. S. Griffiths' paper read before the Institution of Railway Signal Engineers on April 17 (further reference to which appears on another page) was not directed at arriving at the relative merits of the lower and upper quadrant movements as such. Its originator apparently was thinking of the design of signal standard on three of our main lines and criticising its construction and working. The advocates of that signal felt called on to make a spirited defence of it in the discussion. We cannot say that this signal, whatever its working merits may be, appeals to us on the score of appearance, and we are not alone in that feeling, as the head of the signal department of one of our main lines actually represented its ugliness to us as an advantage, saying that it could not help attracting attention to itself. In defending the lower-quadrant arm, Lt.-Colonel E. Woodhouse remarked how the clear-cut angle between arm and post was spoiled in the present design, and its visibility as a signal aspect, as he thought, diminished in consequence. The makers of the early semaphores always had put the glasses and lamps separate from the arm, so leaving the arm and post standing alone to form the day aspect as a clear semaphore sign unhampered by items not belonging to it. When the spectacles came to be attached to the arm they were almost always on the opposite side of the post, so that still the arm and left-hand side of the post formed a sign by themselves, as it were.

We think this adds to the visibility. Sky backgrounds are not so often provided nowadays. Low signals have come into favour, and often all one can see is a coloured bar, for the post is frequently so dirty that it is indistinguishable at any distance.

There seems no reason why one quadrant should not be as good as the other from the point of view of practical operation, as the constructional details can be designed in either case to give reliable working and provide safeguards against adverse weather conditions. Details frequently play decisive parts, and the old Midland Railway signal arms were very well designed from this point of view. They were, we should imagine, the easiest-working signals ever seen on the railways of this country, and it was seldom that an imperfectly-displayed signal was met on that line. Some say that the British upper-quadrant arm more frequently shows a poor "off" indication than its lower-quadrant predecessors, but others roundly declare the opposite to be the fact. We have no statistics to hand on this topic, but we must say that to us the upper-quadrant signal, when it does fall short of stroke, looks a much more woebegone object than the old signals we once knew so well. Many of the latter were given a good stroke to begin with—the G.E.R. signals, for example—and presented a reasonable appearance if they did lose a certain amount. Mr. Griffiths' paper was of more than ordinary interest, as he was concerned in making the first complete installation of upper-quadrant signals in Great Britain, when automatic signalling was put in on the Metropolitan line.

* * * *

Rating of Railways: Fourth Valuation Roll

AN interesting point arising out of war conditions is disclosed by the Bill recently introduced into Parliament and sponsored by the Minister of Health and the Minister of Transport to amend the Railways (Valuation for Rating) Act, 1930. The Fourth Railway Valuation Roll covers the quinquennial period which began on April 1, and in the Act the foundation for the assessments which decide the rating liability is the average net receipts of the particular railway company for the accounting years 1940-1944. During these years the main-line companies and the London Passenger Transport Board have not received the actual revenue arising from the operation of the undertakings, but the amounts prescribed in the agreement entered into with the Government arising out of the control exercised by the Minister of Transport in respect of the railways since September 1, 1939, and which provides for fixed annual payments being made of £43 million. The net revenues of the undertakings which accrued to the Government were greatly in excess of the figure provided for in the Control Agreement, and there was, indeed, a wide fluctuation in the annual sums available after deducting the fixed payments, *e.g.*, in 1941 the amount accruing to the Government was £21,600,000, but in 1943 the figure was £62,000,000.

It was not, perhaps, surprising, therefore, that the rating authorities should have urged that in determining the assessments for the Fourth Railway Valuation Roll regard should be had to the large earnings of the undertakings in the accounting years 1940-1944. On the other hand, however, on several occasions during the war period resolutions were passed at stockholders' meetings pressing for a revision of the Control Agreement so that the stockholders might participate in the increased revenues of their undertakings. The efforts in this direction were, however, without avail, and it would have created an ironical situation if, after the owners of the undertakings had been denied any participation in the excess earnings, such earnings were brought into account to determine the financial benefit that should accrue to the rating authorities. Had the question been allowed to remain at large, insuperable difficulties may have arisen and there may even have been a repetition of the lengthy legal procedings which were taken to the House of Lords before the First Railway Valuation Roll under the Railways (Valuation for Rating) Act, 1930, was finally settled. It is known that there have been conferences between the Railway Assessment Authority, railway companies, London Passenger Transport Board, and the main associations of local authorities in England and Scotland, and that all the interested parties have submitted memoranda for the consideration of the Government Departments concerned.

The determination of the net receipts is only the first stage in the ascertainment of the net annual value, which is the *cumulo* figure to be apportioned among all the railway hereditaments throughout the country. The rateable values are calculated by reference to such net annual value and enable the rate payments to be determined. Between the net receipts and the net annual value lies the difficult problem of estimating the value of the tenant's capital—an almost impossible task in prevailing conditions—and the application of the customary allowance in respect of such capital in order to arrive at the tenant's share. It seems clear that, to avoid the complications which might otherwise have arisen, Parliamentary authority is being sought by the Bill now before the House to fix the net annual values of the respective undertakings for the purposes of the 1930 Act.

It must not be overlooked that the amounts which the railway undertakings receive under the Control Agreement cover receipts from properties such as dwelling houses, hotels, or places of public refreshments, and premises which are so let out as to be capable of separate assessment. In normal circumstances such revenues would be deducted from the net receipts of the respective companies before ascertaining the average net receipts for the purpose of the *cumulo* valuation. Further, in the case of the northern companies, an apportionment between England and Scotland has to be made. In considering the problem due regard has no doubt been had to these two factors, and it is not, therefore, inappropriate to make a comparison between the figures set out in the First Schedule to the Bill as the net annual values of the main-line companies and the London Passenger Transport Board for the purpose of the Fourth Roll, so far as the companies are concerned, and the Third Roll in respect of the Board, and the corresponding figures for the previous completed Roll.

NET ANNUAL VALUES

Undertaking	Railway Assessment Authority's Report Completed Third Roll	Bill Fourth Roll
	£	£
Southern Railway	1,339,806	1,528,540
Great Western Railway	1,631,068	1,860,840
London Midland & Scottish Railway	1,747,573	1,993,760
London & North Eastern Railway	1,281,553	1,462,090
	6,000,000 Second Roll	6,845,230 Third Roll
London Passenger Transport Board	850,000	969,740
	£6,850,000	£7,814,970

It does not need a senior wrangler to calculate that in each case a uniform percentage of increase has been applied, and that the figure is approximately 14 per cent. When it is remembered that during control all the undertakings are being worked as one concern, with traffics and rolling stock of the several undertakings pooled and "clearances" between companies discontinued, it can be appreciated readily that if there was to be any increase there was no alternative to a *pro rata* adjustment of established figures. The companies could possibly have contended for reductions and the rating authorities might have urged that large earnings justified greatly increased assessments, but someone has attempted to solve the problem by direct action, and whoever is responsible is to be congratulated upon the grand simplicity of decision which has resulted in what seems to be an equitable and successful solution of what might have been an almost insoluble problem.

Opportunity has been taken in the Bill to provide for a minor amendment of the principal Act of 1930, rectifying the effect of what is known in the rating world as the Worthing Judgment. Until the proposed amendment becomes law, hereditaments which have ceased to be occupied by a railway company for the purpose of its undertaking may escape liability for rates owing to the fact that no proposal for separate assessment as a let-out property may be made by the rating authority until the hereditament is removed from the Railway Valuation Roll.

The early passing of this Bill will finally dispose of all questions appertaining to the ascertainment of net receipts or net annual values for the Fourth Roll and presumably will give the Railway Assessment Authority the opportunity of proceeding with the apportionment of the respective statutory net annual values and completing the railway valuation roll in accordance with the amended provisions of the 1930 Act, without being fettered by the difficulties it has encountered hitherto.

L.M.S.R. Commercial Organisation

New Arrangements for Maintenance of Public Contact

ONE of the earliest activities of the Commercial Department of the L.M.S.R. in the formation of its post-war policy was the re-organisation of its arrangements for the maintenance of public contact. Two of the fundamental changes in the normal organisation and functions of transport undertakings, which followed the outbreak of war, were:—

(*a*) The railways, and later other forms of transport, were directed by the Ministry of War Transport.

(*b*) Their primary function was the movement of Services personnel and merchandise on behalf of the Services and Supply Ministries.

In these circumstances, private travel was actively discouraged and the movement of merchandise for normal trade became of secondary consideration.

This stoppage of all ordinary commercial activity amongst transport undertakings brought in its train the partial disintegration of the pre-war corps of commercial representatives in direct touch with the public, and only a nucleus remained for the maintenance of contacts with the largest industrial undertakings.

Anticipating in 1944 an early end of hostilities, and realising that one of the immediate post-war needs would be the re-establishment of contact with, and personal service to, the trading and travelling community, the management decided to formulate plans which would enable it at once to put the organisation into operation at the appropriate time. A new technique in outdoor railway representation was envisaged so that the personal service to the public should be of the highest efficiency. The subject was, therefore, exhaustively examined throughout the line with a view to determining—

The best method of representation;
The number of representatives required;
The selection of personnel;
The method of training personnel;
The method of supervision and control;

and the facilities to be placed at the disposal of the representatives to assist them in the efficient conduct of their work.

The organisation ultimately authorised was framed on a standard pattern subject to such modifications as were necessary to meet the local requirements of the respective districts. Some degree of specialisation has been considered desirable, thus enabling a proportion of the representatives to be trained as specialists in the requirements of specific interests. These include representatives for:—

The coal trade;
Livestock traffic;
Specified trades where these are in sufficient volume in a particular area to justify specialisation;
Passenger travel.

The remainder, and the majority, cover the following services:—

Merchandise traffic (freight and passenger train);
All services (operating only in sparsely populated areas);
Merchandise traffic and disposal of town work, such as collection of accounts, and claims matters. } In towns not sufficiently large to justify the employment of both commercial representatives and townsmen.

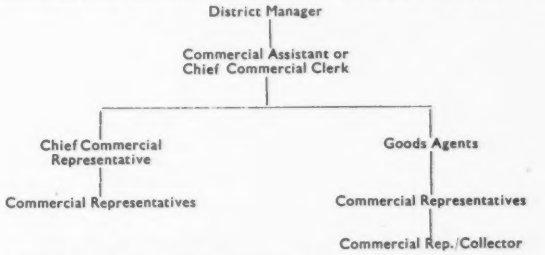
The number of representatives to be employed in England and Wales when the organisation is fully operative is 438, divided as follows:—

Supervisors	16
Specialised trade representatives	65
Passenger travel	110
Merchandise services	181
All services	28
Combined representative/collector	38
Total	438

Of the representatives operating in districts where public transport facilities are infrequent, 92 will be supplied with light cars to increase their mobility.

The administration of the whole organisation is centred in the Chief Commercial Manager's Department at Headquarters, but with the exception of a few specialists employed there who cover the whole line for show, racehorse and theatrical traffic, the representatives are based in the 22 districts into which the line in England and Wales is divided, and are under the control of the respective district officers.

In the large districts they are under the direction of a Commercial Assistant and in others under a Chief Commercial Clerk. In certain large towns they are attached to the staff of the Goods Agent, the latter being responsible to the district officer for the commercial work in his area. The following chart illustrates the line of supervision in a typical district:—



Careful consideration is given to the selection of representatives to ensure the appointment of only those who, by virtue of experience and personality, have the required qualifications. Recommendations are in the first place made by the district officers and each nominee is interviewed by a Headquarters Officer before appointment.

As aids to efficiency the representatives attend regular district conferences under the chairmanship of the district officer or his assistant. They are supplied with appropriate literature and trade journals. Each representative possesses a standard book record giving comprehensive information in regard to each trader on whom he is required to call and also of the facilities and physical features relating to every station in his territory.

Each newly appointed representative will undergo a course of commercial training at the Company's School of Transport at Derby. This is a residential school and the course is of three weeks' duration. Among the subjects included in the curriculum are:—

The functions of transport;
The principles of salesmanship;
Varying methods of sale in trade;
The writing of reports;
Geography;
Railway rates;
Study of terms and conditions of transit;
Railway facilities (transit and ancillary);
Study of warehousing;
Competitive road transport;
Associated road transport;
L.M.S.R. commercial organisation;
Talks by principals of trading organisations and visits to works to study transport problems;
Social habit in its effect on travel;
Cheap travel facilities;
Passenger fares;
Agency work;
Reading of timetables;
Catering for party travel;
Coaching regulations.

A separate course for passenger representatives is run concurrently with the merchandise course. The whole of the students receive tuition in subjects common to both; thereafter each is instructed in the subjects relating to his particular sphere of activity. The ultimate aim, when the staff position will permit, is that all representatives shall commence as trainees in the districts under the guidance of the permanent staff and afterwards attend the commercial course before their actual appointment. The trainee system is not yet in operation.

A similar organisation is operative in Scotland and ultimately 51 commercial representatives will be employed north of the border.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

A Railway Carriage Problem

Cambridge, April 29

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—*The Railway Gazette* of April 26 tells us that the Southern Railway will run 200 more trains on and after May 6. Previous issues stated that the other railways were going to increase their summer services. It is therefore astonishing that the four main-line companies advertise in *Punch* of April 24 that they are short of carriages. We read that "every day 3,500 war-worn carriages—one-eighth of the total stock—are out of action. . . . To restore pre-war standards will take time." So the railways are undertaking ambitious summer programmes with a stock of 28,000 coaches, of which 12½ per cent. are always under or awaiting repair—a Quixotic venture!

Before the war the railways had 42,500 carriages with 2,500,000 seats. According to the summary table of statistical returns published by the Ministry of Transport, at the end of 1944 the main-line stock was 39,540 coaches with 2,360,000, if we assume that minor railways owned about 1,000 coaches with 60,000 seats. At December 31, 1944, the number of coaches under repair was 3,250, or 8 per cent. of the main-line stock. That left 36,290 carriages with 2,165,000 seats available for traffic. During the last 15 months accidents of peace and war would destroy a number of coaches and it is known that some of our passenger trains were shipped to the Continent, but it is incredible that the railways have lost over 8,000 carriages in that period.

If the Ministry had published 1945 statistics, the position would have been clear. Probably the advertisement is incorrect. In any case, should there not be an end to the dismal succession of apologetic notices issued by the railways since the autumn of 1939? Let them imitate the L.P.T.B., who throughout the war struck a livelier note and now talk confidently to the people about the work they are doing.

Yours faithfully,
EAST ANGLIAN

Developments

42, Frederick Street,
Edinburgh. January 30

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—If it is true that the standard of living obtained by nearly everyone engaged in an industry depends on whether it is flourishing or not, then probably it will be of personal interest to most of the people engaged in the railway industry to see that the efficiency of it is increased. But the great trouble is the scarcity of good information on this problem—you cannot turn up a reference book to find out how to effect it. The locomotive lends itself to this study to some extent, but it has to be watched that it does not create a wrong impression, for the locomotive department is probably the one in which there are the greatest endeavours to make advances!

To live in a competitive world it is necessary to do at least two things:—

1.—To improve practice along the lines which have already been established, or which have at least been demonstrated.

2.—To introduce distinct changes into practice.

"Improvement" has become an important part of industrial life, the responsibility for its accomplishment falling on the men in charge of design or management and industrial research. "Progress," however, requires enterprise and inventive or creative ability, and the members of an industry virtually have to rely on projects being offered to them from outside, or from some *unexpected individual* inside. Although these changes are essential from time to time, to bring about the required increases in efficiency, at present it is not the recognised duty of anybody to engage in them or to further those offered.

In place of trusting to such haphazard methods to bring about feasible necessary changes in practice, there is more than a possibility that the matter could be tackled positively; for inventing is quite as purposeful and definite as design or research, although carried out in a different manner. The inventive process is so individualistic and so varied that it is hardly possible to describe it shortly. On the engineering side (the chemical side may be different) it may be divided into two main parts, each of which may be repeated in a particular case:—

(*a*) The art of deliberately making the invention necessary to achieve the desired end (say, to apply atomic energy industrially—which will probably require a totally new type of prime mover).

(*b*) The art of developing an invention, of which there is often a number in one project (the Paget locomotive, for instance).

Neither of these two *arts* can be taught at present; they have to be self-learnt, but after one has had personal experience of them one can learn valuable lessons from the experience of others—when one can get it. In "Invention," Admiral Fiske, LL.D., U.S.N., says: "Whilst investigation and experimentation can hardly fail to secure data, they may secure nothing else, and usually do . . . The work of the inventor is very different from the work of the engineer, and the inventor and the engineer are very different people, though sometimes an inventor and an engineer live under the same skin . . . Seen thus the inventive man having seen the vision becomes a constructive man and puts the vision which he sees into such form that other people can see it too." That is, *when* he is provided with the means to do it. Dr. Kettering (Amer. Soc. Mech.E.) said that he first tried to teach newly hired boys how to fail intelligently, and history suggests that one has to serve a (painful) apprenticeship to learn what he meant in order to profit by it. Many parts of the work are almost the direct opposite of designing, and the men who understand this task are nearly always of a different type from "a master of the craft." Hence quite often, when a designer tackles a job of this kind, *by his very excellence as a designer* he gets into difficulties which he cannot surmount economically or successfully, and there is "a glorious failure."

Two recent addresses tell how a revolutionary change in a heat engine for transport was made and successfully developed. They are the Wright Brothers Lecture, entitled "British Aircraft Gas Turbines" by Dr. H. Roxbee Cox, F.R.Ae.S., given in Washington on December 17, 1945; and the first James Clayton Lecture of the Institution of Mechanical Engineers on October 5, 1945, by Air Commodore Whittle.

Dr. Cox indicates that people at the Royal Aircraft Establishment became interested in the gas turbine for aircraft use about 1926, that some theoretical work was done on the subject and some laboratory experiments were carried out. It appears that *after Whittle had demonstrated some results*, these people started to do something on the practical side. Were they not allowed to do so before; were they disinclined to do anything; or did they not know what to do? Those are the vital questions. It also seems that Whittle, with little money and few technical supporters, progressed much further than these other people with their greater collective knowledge and better facilities.

When Whittle submitted his plans to the Air Ministry and to various manufacturers he was turned down; and events have proved that the reasons given to him were not sound. It was left to two ex-R.A.F. officers to provide Whittle with his required facilities, at considerable personal financial risks. Then there is this very important point: they did not go to an engineering laboratory, to a research association, or to a well-established engineering firm, but they entrusted the spending of their money to this student at Cambridge, knowing that his proposals had been rejected by the best procurable technical advisers (or so it seems), and that the claims made by the inventor were very modest, as events have proved. It just goes to show how different the right way of handling invention is from what it is thought to be!

The railway industry should be grateful to you, Sir, and to Mr. Clayton for having collected and published the data about Col. Paget and his locomotive. In the way you present it, these articles show what and what not to do. When Paget gained the required extra knowledge, as he did by a visit to the U.S.A., *and* was able to work out his ideas without let or hindrance, as he was by virtue of being the General Superintendent of the Midland Railway, to quote Mr. Leech: "In very quick time the traffic system of the railway was reorganised, probably a wider and more far-reaching change than had ever before been carried out on a British railway. All the other railways have since followed the lead thus set, a tribute to his work." His locomotive was an excellent idea, but, as can be seen from Air Commodore Whittle's lecture, Col. Paget had not learned how to develop an invention of this type economically. And as soon as it was taken out of his hands, it was killed—it is easy to put a "baby" to death.

There you have notes on how an important change in the traffic system was brought into being and then into use. Inventing is not a matter of "brain waves in the bath," but comes from *knowledge*, and Paget's visit to the U.S.A. might be likened to some of the preliminary work which an inventor has to carry out. You have also the records of two revolutionary inventions with regard to heat engines, one of which has been successfully developed and brought into use; and it looks as if it will have far-reaching consequences.

Though such changes are so essential to the health of an

industry, their successful introduction rests on the technical inventor and the promoter of the development of inventions; the great obstacle is that technical advisers can seldom assist the would-be promoter in forming his decision as to whether he should engage in a particular venture or not. In fact, for good (mental) reasons the best technicians are almost forced to deprecate such necessary and successful enterprise, with the consequence that the competent technical inventor, like the scientist, has to be given a free hand to some extent.

In other words, when an opportunity occurs, the inventor has to be subsidised more or less blindly as in the case of scientific investigation and research, or, to paraphrase part of Sir Ernest Lemon's tribute to the late Lord Stamp, the inventor has to be supported whilst doubting his invention to some extent. That is one of the reasons why Prof. Sir J. B. Henderson, D.Sc., Adviser to the Admiralty (1927) said when addressing the British Association: "Invention is the heart of industry . . . It may be thought that the development of inventions is one of the functions of industry, but the history of invention and the experience of inventors proves the contrary . . . Most of the great inventions or great strides in industry have not been made in the industry concerned. In many cases the inventor or the promoter or both, have had no connection with the industry affected. . . ."

But—a very large "but" indeed—the conditions of railway work are such that it is very unattractive for the ordinary promoter to finance the development of an invention of any size which is for railway use only, and in consequence, as pointed out by Lord Monkswell, railways have not been obtaining their fair share of progressive changes for a long time. The directors of the railways could, however, easily rectify that state of affairs by having the railway companies subsidise the promoting; practically, they are really the only people who could do this work.

About 1925 the directors of the railway companies found that the organisation was not sufficient to compete with road transport, and an addition was made; money was spent on advertising, and salesmen were employed to obtain orders for traffic.

About 1928 it was realised that this was not enough, and a further addition was made: this time quite a new and separate department was introduced—research. But even this addition has not given the required and feasible progress. The addition of another department to handle the development of inventions would most probably, so far as traction is concerned, give the railways greater technical and commercial benefits than road transport has obtained from the light high-speed diesel, and air transport is likely to obtain from the gas turbine. As regards other departments it should do the same

I am, Sir, etc.,
SYMINGTON MACDONALD

L.N.E.R. Locomotive Rebuilding

Queen Mary College,
London, E.1. March 21

To the Editor of The Railway Gazette

Sir,—Mr. Cook has suggested in his letter in your March 8 issue that it is now safe to draw conclusions about the relative efficiency of the "B1" and "B17" locomotives on the Great Eastern Section of the L.N.E.R. One ought to remember that, even a year ago, there was only one "B17" left in its original condition—2828 of Stratford shed, which retained the higher pressure, while on all others this had been reduced to 180 lb. This reduction caused a considerable loss of efficiency, and it was impossible to make full use of the expansive working which is indispensable to such a design. The superiority of 2828 over the rest of the shed, as regards power and speed, was easily noticeable. This fact alone renders the comparison unfair.

As for facts of performance, for many months I have been comparing the work on the Colchester road of the "B1s," "B12s," and "B17s" in Stratford, Ipswich and Norwich links. Contrary to my expectations, the "B12s" are the hardest runners and the "B1s" the most sluggish. They make plenty of noise without covering much ground. Even on the London—Shenfield length, which includes Brentwood bank, they are outpaced by the other two classes, whereas one might have expected them to excel here, since they have the advantage of a smaller wheel and a much higher pressure. As regards timing, the "B12s" are now on the whole the most reliable machines.

As I have indicated, it is difficult to bring the "B17s" justly into the comparison in their present state of reduced pressure and poor maintenance. Even during the war a good one could put up a brilliant performance, but how seldom we had one like 2870! I must, however, confess that I never heard of a "Sandringham" making a time which a "B12" could not equal. In this connection, statistics about the comparative work of "B12s" and "B17s" on the 510-ton "Hook Continental" in the last year of peace—the severest test of locomotive capacity—would be highly informative.

I have every ground for concluding from my own records that the "B1s" are unsuited to express work on our section. An old Parkeston driver once remarked to me, "There's plenty of talk about these new engines, but with one of our old '2800s' I'd run any of 'em to hell." They may possibly consume less coal and be cheaper to maintain, but they do not give the traveller his money's worth.

Yours faithfully,
JACK WILTON

Railway Statistical Returns

Hampstead. April 20

To the Editor of The Railway Gazette

Sir,—The very clear article in your issue of April 19 deals gently with the statistical summary published by the Ministry of Transport. It is a drawback, as you point out, that figures are not supplied for the individual companies, but a greater defect is the absence of revenue and expenditure particulars. More regrettable still is the failure to give any information about 1945, though the companies have made some play with their own results. A supplementary paper containing last year's statistics should be issued at an early date.

Things are done differently in America, where the railways are free from Government control. On April 15 there came to hand here four statements published by the Association of American Railroads to compare operating results for 1945 and 1944. These statements give a separate analysis of the working of each Class 1 railway under 22 main headings. The same mail brought another A.A.R. comparative statement of railway revenues and expenses for January, 1946 and 1945. We thus know precisely what the American railways did last year and how they are faring currently from month to month, instead of being left to piece together fragments of intelligence as we have to do in the case of our own systems.

Yours faithfully,
STATISTICIAN

Railway Questions and Answers

Meols (Wirral Electric),
L.M.S.R. April 26

To the Editor of The Railway Gazette

Sir,—Your correspondent "Stagnatum," in the April 26 issue, missed the important point of stating his grade. His own case sounds bad, but in fairness to the British main-line railways, their claim is established by the experience of thousands of railwaymen.

I have only one more year on earth than your correspondent's whole railway career, but I am in my eighteenth progressive position in twenty-one years' service, and do not wear an old school tie, boast about good friends "higher up," or claim any special merits or ability. I have attended at the educational classes provided in signalling and clerical subjects without spectacular results, and am still prepared to tackle the next job that is offered.

State control may or may not improve matters of promotion generally, but I do know of a postman who has been such for many, many years, and seems set for his retirement without becoming Postmaster-General.

Concluding, records regularly published in *The Railway Gazette* prove the case for the railway companies. In the April 26 issue, youngsters in my own category can take courage from the history of men like Mr. H. C. Greenfield, M.B.E., in his promotion from messenger boy to Stationmaster, London (Waterloo), 1892-1933, 41 years, and not always easy running. I feel sure.

Yours faithfully,
FRED J. RAWSTHORNE (S.M.4)

"From Cover to Cover"

Great Western Railway,
Chief Mechanical Engineer's Dept.,
Worcester. April 5

To the Editor of The Railway Gazette

Sir,—I shall be retiring from the service of the company on April 27, and should be very appreciative if you could send a copy of *The Railway Gazette* to my private address at Tudor House, Red Hill, Worcester, from that date.

The Railway Gazette is the one railway journal which I regularly read from cover to cover, and its contents I have always found of the very greatest interest.

Yours faithfully,
R. J. ARMSTRONG

The Scrap Heap

Marine excursions for summer holiday-makers are to be run by the G.W.R. from Plymouth to Looe, Fowey, Eddystone Lighthouse and around the "Sound." These will be the first "excursions" to be run by the company since pre-war.

* * *

During the month of March, 1946, 257 special trains were run over L.M.S.R., conveying 114,110 German and Italian prisoners-of-war. This is the highest number of special trains run by the L.M.S.R. for prisoners-of-war during any month since the outbreak of war.

* * *

100 YEARS AGO

From THE RAILWAY TIMES, *May* 2, 1846

RAILWAY MANAGING DIRECTOR.—The Directors of the Cork and Bandon Railway Company are desirous of entering into an engagement with a gentleman who possesses engineering knowledge and railway experience, and in every respect qualified to fill the above office.

Address (with terms and qualifications) the Chairman of the Cork and Bandon Railway Company, No. 20, South Mall, Cork.

Just published, price 1s.

RAILWAY LITIGATION, AND HOW TO CHECK IT; with semarks on the proposed Railway Relief Bill, and Suggestions for the Future Conduct of Railway Enterprise. By THOMAS TURNER A'BECKETT, Attorney-at-Law.

Effingham Wilson, Royal Exchange, and J. Olliver, Pall-mall.

Now Published, 8vo., price Threepence, with a Coloured Map,

NARROW GAUGE SPEEDIER THAN BROAD GAUGE RAILWAYS, AS WELL AS CHEAPER. By HERBERT S. MELVILLE, Esq.

London: W. Stephenson, 12 and 13, Parliament-street.

* * *

OLD COACHES AS WAREHOUSES

So great is the demand by traders for storage accommodation that the G.W.R. is using the bodies of condemned coaches and vans for this purpose as they become available. Undercarriages are removed and superfluous interior fittings stripped from the vehicles before being transferred to sites in station yards.

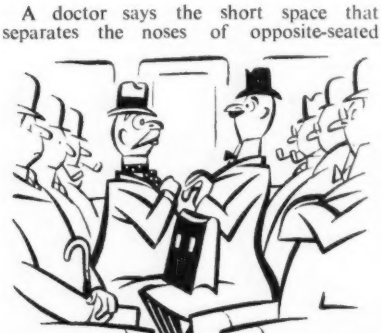
* * *

RAILWAY REFRESHMENTS

Can anyone explain why a lemon squash, orange squash, or a lime juice, all with plain water and in tumblers of equal size, cost 4d. at Swindon, 5d. at Paddington, and 6d. at Victoria? I know, because I drank them at each of these stations yesterday. Since a full bottle costs 2s. 6d. and provides at least 15 good drinks, even the Swindon rate would seem to show a sufficient profit.—*Mr. W. A. Sibly, in a letter in "The Times."*

* * *

A doctor says the short space that separates the noses of opposite-seated



passengers makes surburban trains 'flu traps. Perhaps coach designers will now stagger us.—*From "Charivaria" in "Punch."*

IN THE RUSH-HOUR

It was a crowded Ealing-bound train: passengers were strap-hanging, but one seat was vacant—and remained so. Nobody made any attempt to sit; newcomers pushed to claim it—then withdrew. The train had stopped at 31 stations from Dagenham to Hammersmith; all that way there was a passenger in the seat—a black-and-white kitten—a waif whom nobody wanted.

* * *

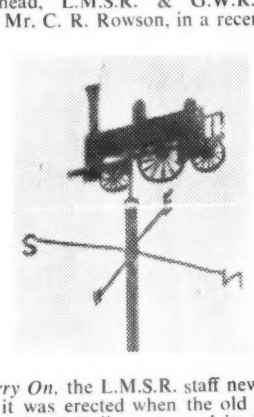
STEEL MADNESS

Nationalised production is not cheap production, as experience overseas has proved and as Mr. Shinwell has admitted. When the present honeymoon period in overseas markets has passed, British industry as a whole will pay the price of the folly Mr. Mikardo initiated. The optimist may take comfort in the old tag about the gods making mad those whom they wish to destroy, for clearly this decision is madness. But the destruction will take time, and meanwhile it may not be merely a handful of demagogues who will suffer.—*From "Candidus" in "The Investors' Chronicle."*

* * *

RAILWAY WEATHER-VANE

The weather-vane reproduced below is on an office building at Town Station, Birkenhead, L.M.S.R. & G.W.R. Joint Line. Mr. C. R. Rowson, in a recent issue



of *Carry On*, the L.M.S.R. staff newspaper, states it was erected when the old Chester & Birkenhead Railway opened its Merseyside terminus at Town Station. The engine silhouette on the weather-vane represents one of the Forrester 2-2-2 engines, which brought the first trains to Town Station in 1840.

* * *

DEMI-SEMI-QUASI-NATIONALISATION

The Prime Minister's famous pronouncement on the demi-semi-quasi-Nationalisation of the Iron and Steel Industry led a spokesman miles out of touch with official circles to attempt an explanation.

Nuts will be nationalised, but not bolts; drop forgings, levers, screw-couplings, pinions, spindles, brake-rods and gun-tubes, but not manganese steels for tram-lines. Tungsten for notched crank-shafts, but not carbonised alloy steels for oil-tempered springs or toy-railway lines with a gauge of under two inches. Part will be, part not.

Meanwhile, the partial nationalisation of the railways is being discussed. Trains travelling north to south at not less than 31 miles an hour will be half-nationalised. Those travelling in other directions and at other speeds will be only quarter-nationalised unless the month begins with an O. —*Beachcomber in the "Daily Express."*

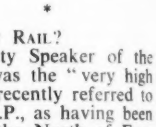
Personal Questions

Were you born polite?

A man may think he washes his hands or says, "Thank You," by inborn instinct. But ask anyone who "knew him when." The truth is, we are all born little savages. We grow civilized by training and example when we are children. And, while it is "hard to teach an old dog new tricks," we can go on becoming more courteous all our lives. Only one thing is necessary. That is to realize how much courtesy toward others smooths our own paths . . . and what a powerful force it is in attracting patrons to our Railroad.

Are your eyes X-Rays?

No. And neither are anyone else's. That is why *personal appearance* is so important. If a conductor wears a soiled or wrinkled uniform, can passengers be expected to see the heart of gold beneath it? If a supervisor wears stubble on his chin, will his workers be inspired to do their jobs smartly? Naturally, clean hands are more important in the dining car than around the roundhouse. But we can all be neat according to our jobs . . . and help build the kind of impression that builds business for the Railroad and jobs for its employees.



[*From "Company Manners" issued by the New York Central System*

* * *

QUICKER BY RAIL?

Major Milner, Deputy Speaker of the House of Commons, was the "very high officer in this House" recently referred to by Mr. E. Walkden, M.P., as having been "lost half way round the North of England" on a flight from London to Yorkshire. Major Milner's own account of the episode is that he left Hendon at 11.8 a.m., expecting to land at Yeadon, the Leeds-Bradford airport, in 1½ hr. Looking over the side about an hour later he observed an expanse of water, and was told by the wireless operator of the aircraft that they were over the Humber, having had difficulty in approaching Yeadon because of fog. Major Milner's own account continues: "I suggested he should proceed due west. Some twenty minutes passed, and the wireless operator came through again and said the 'plane had been as far west as Selby, and was unable to get any nearer Yeadon because of weather conditions. We were over Newark, some 50 miles south of Selby. I instructed the pilot to get on the main railway line, and in about 10 minutes I landed at Doncaster."

* * *

OPERATING ODES

Initiative

The horse of whom you've heard before
(Remember how it loudly swore
When Sheffields didn't go in two?)
Oft thought it had too much to do.

For years and years with chain and rope
It pulled the wagons up the slope.
The horse was getting past its prime
And now deserved an easier time.

But duty called. The nation's need
Must ever conquer private greed.
With Attlee's broadcast in its ears
It carried on beyond its years.

And then one day it chanced to see
A page which wrapped a shunter's tea.
It read there in that old *Gazette*,
Of engines now propelled by jet.

It ruminated all that day.
The next, they saw to their dismay,
Fixed to its tail just like a gun
Was "Units, jet propulsion, one."

H.W.W.

OVERSEAS RAILWAY AFFAIRS

(From our correspondents)

INDIA

Riot Damage at Delhi

Sir Edward Benthall, War Transport Member, stated in answer to a question in the Central Assembly, that, except for three record and a few other rooms, the Railway Clearing Accounts office buildings, with all their contents, were burnt down by a mob on March 7. The loss on account of the destruction of the set of buildings belonging to the North Western Railway is estimated to amount to Rs. 66,000, and the loss on account of the destruction of the set of buildings belonging to the Chief Commissioner, Delhi Province, is estimated at Rs. 400,000. Furniture losses amount to Rs. 275,000. It is proposed to rebuild the office.

"Stay-in" Strike at Lahore

A two-hour "stay-in" strike was staged by N.W.R. employees at Lahore on April 11. The strike involved staff employed in Moghalpura mechanical workshops, the locomotive shed, signal shops, general stores, washing lines and shunting, traffic and goods yards; and to a lesser extent involved clerks employed in the General Manager's and Divisional Superintendent's offices.

The strike is understood to have been called as a protest against reduction of the cereal ration and part substitution of rice for wheat. Trains passing through Lahore were delayed, and it is learned that the driver of a local train so affected had to seek refuge in a signal box from a crowd of angry passengers.

The strike otherwise appears to have been peaceful and orderly throughout, and workshop strikers are understood to have volunteered for overtime work on the evening of the day of the strike in order to maintain normal output. The strike was not sponsored by any recognised union, but was the outcome of the effort of certain isolated individuals. Two railwaymen have been arrested in connection with the strike.

SOUTH AFRICA

Orange Free State Developments

Further details are now available of the railway developments to be undertaken in the Orange Free State, a summary of which was given in *The Railway Gazette* of February 8. A new station will be built at Bloemfontein, immediately behind the present station, avoiding to some extent the present curves at each end and allowing of straight platforms of 1,300 ft. To avoid congestion on the main passenger lines, avoiding lines will be provided for goods trains.

Whatever gold mining developments occur in the area, there is no doubt that they will greatly affect the volume of traffic, both passenger and goods, handled on the existing lines of the Free State, which are already very heavily taxed. The main line from Bloemfontein to Kroonstad is to be doubled along its entire length of 111 miles, and at the same time will be straightened; the cost of the work will be at least £1,550,000. The line from Bethlehem to Harrismith, 65 miles, will be straightened at a cost of £500,000. Although the saving effected in mileage will not be great, the easing of curves will enable train speeds to be increased to 55 m.p.h. instead of 33 m.p.h. as at present.

Bethlehem will benefit by the expenditure of £53,000 on alterations to the marshalling yard, and a further £27,000 on remodelling the locomotive yard. A new station will be built at Sherbrooke, 15 miles beyond Bethlehem. Hamilton, just outside Bloemfontein, is to have a new station.

Branch Line to Odendaalsrust

Alternative plans were put forward at a meeting recently between Mr. F. C. Sturrock, Minister of Transport, and a deputation from the Orange Free State, which discussed problems in connection with the construction of a new railway line to serve the Odendaalsrust district goldfields, where the new gold reef strike has been made. The delegation, which included representatives of East London, Bloemfontein and Port Elizabeth municipalities, and the East London Chamber of Commerce, urged that a new railway line be constructed from Theunissen to Odendaalsrust, while Mr. Sturrock stated that his technical experts had recommended a line from Whites to Odendaalsrust. He added that he had not yet finally accepted this recommendation. Whites and Theunissen are both on the main line from Bloemfontein to Kroonstad. The distance from Odendaalsrust to Whites is about 24 miles.

PALESTINE

Middle East Railways Conference

The first meeting of the Middle East Railways Conference, convened by the General Manager of the Palestine Railways, was held in Cairo on March 28, and was opened by His Excellency Mahmoud Shaker Mohammad Pasha, General Manager of the Egyptian State Railways. The following railways are members of the conference: Egyptian State Railways; Iraqi State Railways; Turkish State Railways; Chemin de fer Damas, Hamah & Prolongements; Palestine Railways; Chemin de fer du Hedjaz (Syria).

The first meeting was attended by:—

Mohammad Bey Kamel El Khishin, Ibrahim Bey Hilal, Mr. R. Bonner, Abdul Wahab Bey Saleh, Fahmi Bey Rizk Soliman, Mustapha Bey Said, Fawzi Bey Girgis (Egyptian State Railways); Major-General H. C. Smith (Iraqi State Railways); Sefik Bey Etensel, Mumtaz Bey Somer (Turkish State Railways); Abdul Wahab Bey El Malki (Chemin de fer du Hedjaz); M. P. Bourguignon (Chemin de fer Damas, Hamah et Prolongements); Mr. A. F. Kirby, Mr. A. G. Norman (Palestine Railways); Brigadier R. E. Bagnall Wild, Lt.-Colonel Barker (British Army).

The first meeting was largely explanatory in scope, but a sub-committee was set up to report upon means of achieving rolling stock exchange between the railways of the conference. The next meeting is to be held in Istanbul on June 26.

CANADA

C.N.R. Contribution to Canada

Speaking of post-war world prospects in Montreal recently, Mr. R. C. Vaughan, Chairman and President of the Canadian National Railways, said that transport would always be of paramount importance to human relationships. Canada still enjoyed a level of railway freight rates which on a ton-mile basis was the lowest of any civilised country, notwithstanding very difficult operating conditions. The railways had helped build the country, and they would be called on to assist in its development to further greatness.

Anyone who might have been so short-sighted as to dismiss the railways as obsolete, learned during the war that railways were essential. Not only were they essential, but they might be depended upon. The railways were able to handle the enormously increased load at a time when they were handicapped by shortages of manpower, equipment and supplies; they were able to do the job efficiently and economically, because they were flexible organisations, consistently keeping abreast of needs and development.

In giving an account of the stewardship of the system, which he described as the loyal and faithful servant of the people of Canada, Mr. Vaughan said that the war had demonstrated beyond any doubt the capacity of the C.N.R. system to handle traffic in tremendous volume. It had demonstrated the earning power of the system. From 1941 to 1945, he pointed out, it paid the Government $112,000,000 in cash from earnings, and for interest approximately $78,500,000.

UNITED STATES

Coast-to-Coast Sleepers

Since March 31 certain Eastern and Western railways have co-operated in the working of through Pullman sleeping cars from coast to coast. A car attached to the New York Central "Twentieth Century Limited" leaves New York at 5.30 p.m. and reaches Chicago at 9.30 a.m. the next morning. Here it is transferred to "The Chief" of the Atchison, Topeka & Santa Fe, departing for Los Angeles at 12.1 p.m. The car arrives in Los Angeles at 11.50 a.m. on the third day out of New York. There is a similar service in the reverse direction. Although there is no reduction in overall timing, passengers are saved the inconvenience of transferring themselves and their belongings from train to train, and can remain in the cars throughout the shunting operations and the stay in Chicago if they so desire.

A choice of two New York—Los Angeles through routes, and one to San Francisco, is offered by sleeping cars attached to the Pennsylvania "Broadway Limited" between New York and Chicago. One car is handed over to "The Chief" similarly to the New York Central service already mentioned; a second car proceeds from Chicago to Los Angeles *via* the Chicago & North Western and Union Pacific routes; the third car is taken on by the Chicago & North Western, Union Pacific, and Southern Pacific to San Francisco.

Yet another through service utilising "The Chief" between Chicago and Los Angeles is a Washington—Los Angeles sleeping car originating on the Baltimore & Ohio, which runs on that company's "Capitol Limited" between Washington and Chicago.

Detecting Hot Boxes

Extensive application is now being made on the New York Central of a method of detecting hot boxes by means of cartridges which emit a cloud of white smoke and a distinctive odour when their temperature rises above a certain level. The cartridges are inserted into prepared cavities in both plain and roller bearing types of axlebox. They come into action at 220° F. in roller bearing boxes, 320° F. in waste-packed plain bearings, and 450° F. in grease-lubricated plain bearings. Every bearing is fitted with two cartridges, one emitting smoke to draw the attention of observers

outside the train to the hot box, and the other producing an odour which is readily recognised inside the train. Both phenomena last for from eight to ten minutes. A programme of installing the cartridges in more than 75,000 bearings has been embarked upon. All high-speed passenger locomotives are included, together with all new roller-bearing passenger cars.

FRANCE

Passenger Transport Board for Greater Paris

Passenger transport services in the Paris and suburban areas, including the Metropolitan underground lines, are to be placed under direct State control. This control will be exercised through two distinct authorities. In the first place, a board on the lines of the London Passenger Transport Board will have independent operating control of the Metropolitan underground lines and the associated motorbus services in Paris and the suburbs. It will also take over the hitherto independent transport companies operating in outlying districts, including Versailles. This board will be known as the Régie Autonome des Transports Parisiens (R.A.T.P.). In the second place, certain powers, particularly the fixing of fares and the creation of new services, will be vested in a body styled the Office des Transports.

This scheme for the co-ordination of passenger transport services throughout the Greater Paris area, drafted by M. Léon Hamon and presented by him to a recent meeting of the Paris Municipal Council, was adopted after an animated debate by a vote of 56 to 4. In an interview, M. Hamon has explained that the administrative board (R.A.T.P.) would comprise representatives of the ministries, the department (county) councils, the Paris Municipal Council, and members designated by the Minister of the Interior and the Minister of Transport, such as secretaries of trade unions, the President of the Chamber of Commerce, and technical experts. The board would have full powers to raise loans for establishing new lines, and would accept responsibility for interest payments on loans raised by local authorities.

Deficit in Transport Services

The Office des Transports would represent the local authorities, the Paris Municipal Council, and the State. As representing the local population, the office would decide such questions as fares, and the district that a new Metro or bus line should serve. If it decided in favour of a subsidy rather than a rise in fares on an existing service, it might appeal to the State, the Paris Municipal Council, or to local government budgets. A credit from the State would entail a parliamentary vote. M. Hamon pointed out that it would be difficult to avoid a deficit at the outset. Already, he said, the Paris transport services showed a deficit for 1945 of fr. 1,000 million (more than £1,000,000 at fr. 480 to the £).

Suburban railway lines, which are already favoured by low fares under the management of the S.N.C.F., would not come under the control of the R.A.T.P., but the Office des Transports would have certain limited co-ordinating powers.

Paris Metropolitan Company

With reference to the financing of the scheme, M. Hamon drew attention to the fact that the City of Paris had constructed the underground system, for which it had issued loans amounting to fr. 3,500 million, while the Paris Metropolitan Company raised fr. 1,500 million for the rolling stock and equipment. For the suburban Metro and the Sceaux line, the Department of the Seine had raised fr. 1,000 million, and the Metro company fr. 700 million for the equipment. This made a total of fr. 6,700 million (£13,958,333 at fr. 480 to the £).

The Paris Metropolitan Company, formed by the Belgian financier, Baron Edouard Empain, in May, 1898, was sequestrated on January 3, 1945, on a charge of collaboration during the occupation period. As a result, the Metro lines are already under direct State control, but this control is based only on a ministerial decision. M. Hamon did not indicate what compensation the company's shareholders might expect, but judging by Government action in various nationalisation projects now in progress, the shareholders might be given 3 per cent. obligations of an amount equal to the market value of the shares on the day they are taken over.

Publications Received

Surveying for Young Engineers.—By S. Wright Perrott, M.A.I., M.Inst.C.E., late Professor of Civil Engineering, University of Liverpool. Published by Chapman & Hall Limited, 37, Essex Street, London, W.C.2. 232 pp. 7½ in. × 5 in. Price 10s. 6d.—This book is essentially a practical guide to surveying of the less-advanced order and concentrates mainly on various kinds of fieldwork and the instruments required, together with plotting in the drawing office. Chapters are, however, devoted to map reading, setting out railways and structures, and the care of instruments. The author is careful to explain fully the work for which each instrument is required before describing the instrument itself in detail. Two chapters on contouring include a method of levelling or uniformly sloping off an irregular field to form a sports ground, but there is no mention of the all-important method of plotting a "paper" alignment for a railway or road with a ruling gradient (and limited curvature) on a contoured sheet. The book should, however, prove to be of good practical general value to the young surveyor.

Titled Trains of Great Britain.—By Cecil J. Allen. London, 1946: Ian Allan Limited, 225-7 Laleham Road, Staines. 8½ in. × 5¼ in. 128 pp. Illustrated. Price 6s.—In 1939 there were few important main-line expresses that were not either named officially, or had been endowed with names recognised by long usage. By including both categories, Mr. Allen's review presents a very complete survey of the best pre-war services. Having travelled nearly 2,000,000 miles by trains in the past 37 years, Mr. Allen writes with an intimate knowledge of his subject that covers the development of the services from their inception, details of operation and rolling stock working, and, of course, those particulars of the locomotive performance involved which are his special province. Nearly all the trains dealt with are illustrated, and some of the photographs reproduced show them in their earlier days behind locomotives now displaced by standard classes. The standard of production of the book is of a high order for present conditions, and the illustrations, which include several whole-page plates, are well reproduced. In addition to particulars of the normal daily schedules of the trains, Mr. Allen recalls the high lights and records of some historic test runs, such as those of the L.N.E.R. "Silver Jubilee" and the L.M.S.R. "Coronation Scot." Speed, however, is by no means the main theme of the book, and the chapters on cross-country services, with their routes and through connections, are as valuable as those dealing with the more publicised expresses.

Handbook for Electric Welders.—A new departure differentiates this from the previous editions of the Murex Welding Processes Limited handbook. The attempt to provide elementary general instructions for the beginner is abandoned in favour of chapters on more specialised information. At the same time the compilers do not lose sight of the fact that the book is likely to be referred to by users of a very wide range of welded articles, so that the broad principles of the art are still retained. The result is an extremely useful manual, likely to be of particular value to the engineer who has obtained a grounding in the subject either with his firm or at his technical institute, and who does not need to delve into the deeper physical or metallurgical aspects. Even if he does, a short bibliography is added. The information covers non-ferrous metals as well as steel and cast iron and there are useful chapters on the physical properties of welds and their mechanical testing. As a reference book one of its valuable features is the inclusion of an appendix giving a list of the British Standards Specifications relating to welding. An increasingly important factor in welding technique today, which might well have formed an additional chapter, is the use of manipulators; we hope that in a future edition this—and the inclusion of an index—may be considered.

Hoffmann Bearings.—With the object of showing the widespread use of its products, and at the same time providing a record of the activities of the firm during the war, the Hoffmann Manufacturing Co. Ltd., Chelmsford, has brought out an illustrated brochure describing the applications of its bearings. Although the greater proportion of its products in recent years has been used in the manufacture of aircraft, wheeled vehicles, tanks, guns, etc., large quantities have also been supplied for the equipment and maintenance of essential industry. The capacity of the several Hoffmann works has been increased considerably during the war, and this increased capacity will enable the firm to meet the reconstruction needs of industry.

Thameside.—By the Thameside Development Board, 41, Whitehall, London, S.W.1. 6½ in. × 8 in., 26 pp., with photographs and a large map. This brochure describes the functions of the Board which serves the territory along both banks of the Thames from the Pool of London almost to the sea. In 1939 the industries of Thameside had a gross annual output of £275,000,000 and employed 900,000 workers. They are served by 290 miles of railways and 13 major goods stations. The map, which is provided as an inset, has been designed to show at a glance the number of important sites available for industrial development.

Locomotive Limitations*

Summary of the first Sir Seymour Biscoe Tritton Lecture, delivered by Mr. Julian S. Tritton

WHEN I was honoured by the Council's invitation to deliver this, the first of a series of lectures designed to contribute to the art and science of locomotive engineering, it seemed to offer an opportunity of taking stock of the position and making a progress report at the end of the second world war.

Successful design is largely a matter of appreciation of the limitations of existing practice; our strategy of development is to attack them at the points where the prospects of success are brightened by the adoption of new technique and new materials.

Two inherent limitations of the locomotive are, first, that it has to haul its own weight, and second that that weight must yet be sufficient to produce the necessary adhesion for the driving wheels. Although there are cases of adhesion railways working on grades as steep as 1 in 14½, 1 in 20 is accepted as the economical limitation for a ruling grade. It is just over 100 years ago that the last train was hauled up the 1 in 70 grade out of Euston over the Camden Incline on the end of a rope. When the ropeway was installed, 1 in 70 was considered the limit for adhesion traction; and engineers had not learned to think in terms of 22½-ton axle loads.

Effect of Wedging Action

I once witnessed trials of a locomotive with V-grooves in the driving wheel tyres, which engaged inclined faces on each side of the rail top. The wedging action on the rail sides enabled the locomotive to haul its normal load up a grade of 1 in 8 without slipping. The disadvantages were too great to make the system practicable.

We have not yet been able to apply the pneumatic rubber tyre to carry the axle loads required, despite its attractively high coefficient of friction. The load capacity here depends on the volume and pressure of contained air and its area of contact with the road. The latter is far greater than can be carried on a short section of rail top; axle loads were thus limited in Micheline railcars to about 30 cwt.; and sixteen rubber-tyred wheels were needed to carry a car of only 12 tons.

The customary system of defining axle load in terms of the static loading permitted on a group of axles has been a source of controversy between the locomotive engineer and the bridge engineer. Admittedly the latter had good cause in certain earlier designs for allowing a wide margin to take care of dynamic augment or "hammer blow," and latterly they have welcomed the introduction of three- and four-cylinder, turbine, electric, and internal-combustion locomotives in which there is no dynamic augment. The L.M.S.R. allowed an increase of 10 per cent. in the static axle-load when it adopted multi-cylinder in place of two-cylinder locomotives, and in the turbo-locomotive, from which out-of-balance forces are eliminated, an increase of 25 per cent. was allowed.

Experiments in India showed the feasibility of running two-cylinder locomotives, from which the reciprocating balance had been removed altogether, at 60 m.p.h. Apart from this, light alloys are being increasingly used for reciprocating parts, but the difficulty is that larger sections are needed for the same strength as steel.

Within the limits of adhesion and axle-load the next important limitation in locomotive design is the running gauge or limit of overall dimensions. The American composite moving gauge has a cross-sectional area 45 per cent. greater than the British. The Berne Conference gauge (width, 10 ft. 2 in.; height, 14 ft.) showed how early Continental engineers had seen the limitations of the British loading gauge. The harassed designer has to juggle with cylinder and boiler dimensions to meet the loading gauge limitations, which are:—

(i) The cylinder diameter which can be got between or outside the wheels.

(ii) The diameter of the boiler barrel to be mounted over the driving wheels.

(iii) The width of the firebox.

(iv) The permissible overhang on curves.

The diameter of inside cylinders obviously is limited by the track gauge, so on narrow- and metre-gauge lines inside cylinders practically are ruled out. The diameter of outside cylinders is limited by the distance between outside crankpin centres and the width of the loading gauge. For British lines the track gauge limits the diameter of inside cylinders to 21 inches and the loading gauge limits outside cylinders to 22 inches. Platforms and fixed structures alongside the track often impose equally annoying limitations.

With the stroke limited to some 28 inches, and having reached the limit of capacity of two cylinders, the designer is forced to three- and four-cylinder types. The diameter of the third cylinder is limited to that of the outside cylinders, to obtain an even turning moment. To get maximum diameter in four-cylinder designs, one pair is usually displaced to clear the outside cylinders.

Compounding is an attempt to overcome the relatively low thermal efficiency of the cycle on which the orthodox reciprocating locomotive works, which is only about one-half the Rankine cycle efficiency. Thus for cut-offs of 20-30 per cent. the efficiency is about 10 per cent., increasing to about 12 per cent. with cut-off at half stroke. The reason is a combination of low pressure, drop in temperature during expansion, and loss of energy through the exhaust at a back pressure of some 4 lb. per sq. in. Compounding, combined with exhausting to a vacuum, should show a fuel economy (for the same speed) of 20-25 per cent., and offers great attractions.

It is sometimes not realised that when working with a vacuum the use of energy contained in steam expanded from 6 lb. per sq. in. abs. to 1 lb. per sq in. abs. is over 60 times more economical than the raising of the boiler pressure by 5 lb. per sq. in. (for example, from 195 to 200 lb. per sq. in.). Condensing locomotives, unfortunately, have proved impracticable, because of the added weight and complication of the cooling system. The limitations of compounding without a condenser, however, are less stringent: they are the size and weight of the low-pressure cylinders and the difficulty of getting steam into and out of them. Chapelon realised the need for increasing the low-pressure cylinder volume and valve area in 1930 when he designed his six-cylinder compound with four low-pressure cylinders. These disadvantages have not restricted the use of the Mallet compound formerly so popular in the U.S.A. In these large sizes the disadvantages are of less account; and the increased thermal efficiency (about 2-3 per cent.) becomes worth while. However, it is fair to say that compounding only survives under the enthusiast.

An alternative way of using the energy in the exhaust steam has been proposed by Mr. Reidinger. Exhaust steam from the cylinders passes to a receiver, and is fed thence to a unidirectional turbine driving through a pair of right-angled bevels and a double reduction gear on to the leading coupled axle. A fluid coupling is incorporated into the train of gearing after the bevel drive. A second fluid coupling could be used for reversing if necessary. A directional control interlocked with the cylinder reversing gear is needed to prevent working the turbine in opposite direction to the cylinder. The final drive to the leading axle is through link or quill gearing, to allow of axle movement. The turbine may be cut in or out at any moment or any speed; it can be overloaded up to the steaming limit of the boiler, and can be used as a booster to deal with peak loads.

Efforts to use, instead, a large number of small cylinders and running the engine at a higher speed resulted in the Sentinel double-bogie locomotive, with water-tube boiler, for the metre-gauge Colombian National Railways (1933); the locomotive is capable of hauling 200-ton loads over very difficult sections some 8,000-12,000 ft. above sea level. A test speed of 56 m.p.h. was attained on very poor track, and, with certain modifications to firebox and air intakes, they are now very satisfactory.

Considering now full steam turbine drive as a weight and bulk saver, Mr. Bond's recent paper gave us the pros and cons of the modern non-condensing turbine locomotive, and pointed out that the turbine drive offered an increase in capacity of over 30 per cent. for a large proportion of its working range.

Coming now to boiler limitations, wheel diameter restricts the boiler diameter in express, though not freight, engines, so the length is increased instead, and bogies or pony trucks (as in 4-6-2s, 2-8-2s, etc.) are needed to take the overhang. British practice limits the firebox length to 11 ft. (11 ft. 6in. in the G.W.R. "Kings") and hence the grate area to about 33 sq. ft. which, when burning coal at 100 lb. per sq. ft. grate per hr. will not give more than about 1,500 rail h.p. Beyond this, we must adopt wide fireboxes.

Flange Forces

Increased speeds of operation, to raise the volume of traffic carried, focus attention on the riding qualities of the locomotive. Flange forces, too, come particularly into prominence at speeds approaching 100 m.p.h. Apart from some French experiments in 1883, work on this question was largely qualitative, up to 1900; but since then experiments in France, America, Germany, and India have given useful quantitative results. American trials took place on 400 yards of rail which, through a series of Brinell balls, made impressions on specially prepared plates when a locomotive passed over, and showed a side thrust varying from 6-7 tons at 50 m.p.h. up to 11.2 tons at 95 m.p.h. Modifications made in the light of these results enabled flange forces to be reduced 40 per cent. at 70 m.p.h.

(*Continued on page* 486)

* Paper read by Mr. Julian S. Tritton before the Institution of Locomotive Engineers on April 10.

A Neglected Point in Switch Design

Avoiding contact between back of wheel flange and open switch

IN speaking of a neglected point in switch design, the word "neglected" is used with reservations. The point which is to be brought out may have been overlooked merely. On the other hand, it may have been noticed, considered, and discarded as being of no importance.

The story goes back to the first world war, at the marshalling yard at Kantara, which was at the beginning of the military railway from Egypt to Palestine. A derailment had taken place in this yard. A rake of wagons was being hauled by a 6-coupled saddle-tank shunting locomotive of normal design in a facing direction through a turnout on to the right-hand diverging road. The locomotive took the turnout correctly, but the first wagon behind the locomotive took the route which is shown approximately by the dotted lines in Fig. 1. As the shunter, who had set the points, was quite certain that the switch point had been properly closed before he signalled the movement, the yard foreman, who had every confidence in the shunter, decided that something unusual had happened. As the writer happened to be in the vicinity at the time he was asked to inspect the site before anything was moved. The points were found to be in good working order and would close correctly for either road. The wheel flanges of both the locomotive and the wagon were considerably worn; those of the wagon more so that those of the locomotive. Rail climbing by the rather sharp flange of the wagon wheel was suspected, but no signs of this were visible. There were signs which showed that the wheels had dropped on to the sleepers as soon as the space between the diverging rails permitted.

It was decided to repeat the movement after re-railing the wagon. The point lever was not held during this operation, as it had not been at the time of the derailment and it was desired to repeat everything as closely as possible. While the repeated movement was taking place a very close watch was kept on the left-hand switch. When the leading wheels of the locomotive were partly through the switches the point of the left-hand switch commenced to open. This opening attained a value of a little under three-eighths of an inch. It did not close again as the movement proceeded, probably because of the effects of friction and inertia. The tyre of the leading wheel of the wagon entered this opening with the result described.

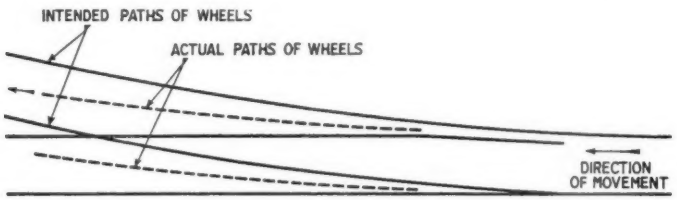


Fig. 1—Wagon derailment

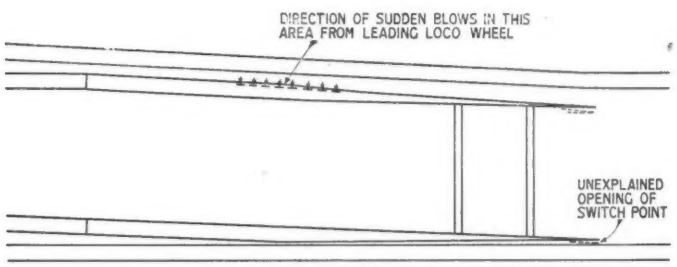


Fig. 2—Probable conditions at derailment

No one can be certain of the exact events, but the cause of the opening appeared to be the pressure, or rather the blow, from the flange of the leading right-hand wheel of the locomotive on the back of the open right switch. This would cause some flexure of the switch which was communicated to the left-hand switch by the stretcher bars. This effect would be enhanced somewhat by any looseness of the heel joint, a fault which is inherent in this type of switch unless a special joint has been fitted. An attempt has been made to show what happened in Fig. 2, but it is not easy to do so, notwithstanding exaggeration in scale across the track.

The actual splitting of the switch may have been facilitated by the probability that the wagon-wheel flange was hard up against the left-hand rail. When a locomotive of the type used enters a right-hand switch the drawbar hook at its rear starts to move to the left of the centre line of the track, due to overhang. This offset may amount to as much as 3 in. by the time all the driving wheels are on that switch. The result is a decided pull towards the left on the front of the first wagon in rear of the locomotive, which is the one which split the points.

These switches, which had a heel joint, were made with the standard clear flangeway of 1¾ in. In these circumstances, it is impossible to avoid contact between the wheel flange and the back of the open switch. Considerable pressure must be exerted by this contact, as witness the fact that check rail bolts often break in service. Blows of this sort should be avoided in switch work, as the switches are in no way designed to withstand them; only harm can result, culminating in increased maintenance and risk of broken parts.

A switch should be designed so that there can be no contact between the back of a wheel flange and the back of the open switch. A sufficient width of clear flangeway will ensure this. The question is: how much to allow? Three diagrams have been prepared to help in arriving at the answer. Fig. 3 shows the state when new wheels are running truly central. Fig. 4 shows a new left-hand flange hard up against the left-hand rail, in which state the standard check-rail clearance of 1¼ in. is exemplified. In Fig. 5 a worn tyre is shown hard up against the lef-hand rail. In this condition a clear flangeway of at least 2¼ in. would appear to be necessary. It might be wise to allow 2½ in. so as to be on the safe side. This, however, can be regarded as a maximum, unless there is much side wear of the rail head or the gauge has spread, but these conditions should not be allowed to remain for long in turnout work. Anyone who doubts the necessity for clearances of this amount easily can make actual and visible checks by examining the splayed ends of check

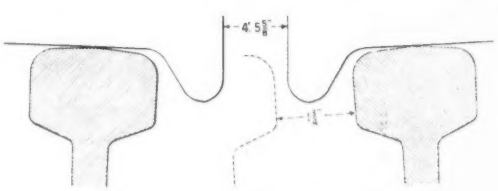


Fig. 3—Wheels with new tyres running central

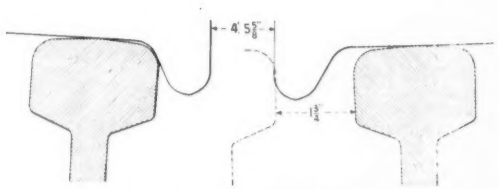


Fig. 4—New tyre running hard against left rail

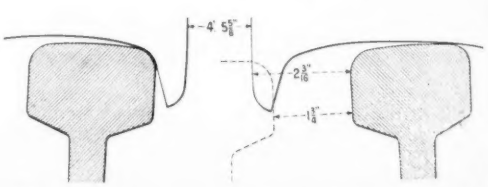


Fig. 5—Worn tyre running hard against left rail

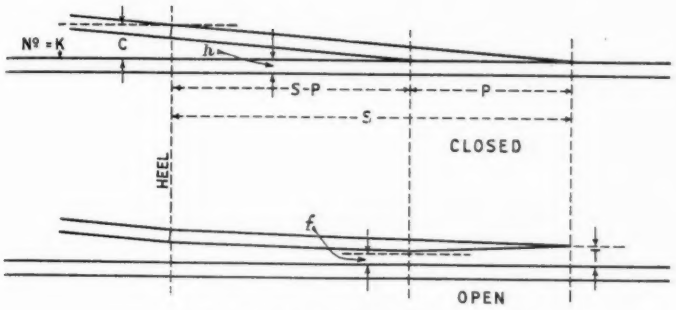


Fig. 6—Straight switch with heel joint

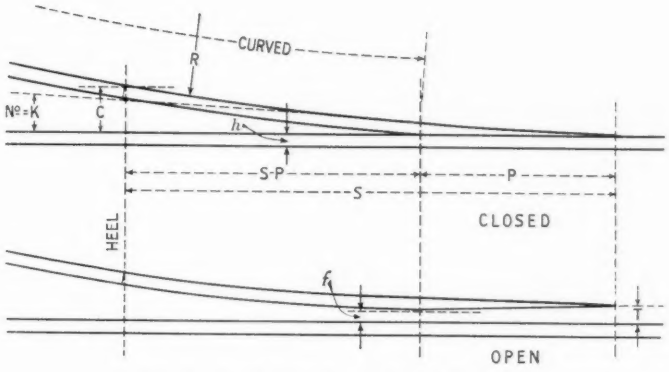


Fig. 7—Semi-curved switch with heel joint

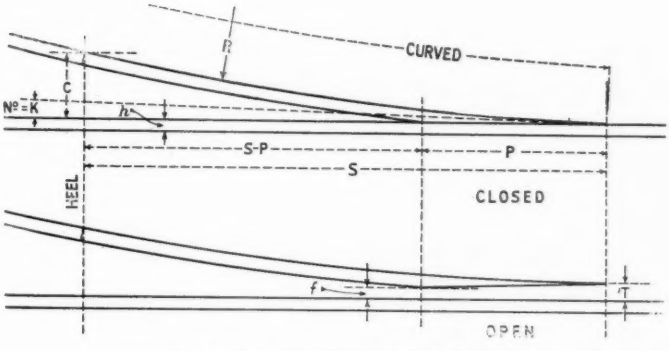


Fig. 8—Curved switch with heel joint

rails and the vicinity of switches of existing design.

To arrive at the conditions which will give a clear flangeway of any pre-determined value reference will be made to Figs. 6, 7, and 8. Straight, semi-curved, and curved switches, with and without heel joints, will be considered. These figures show heel joints, but are equally applicable, as far as this discussion goes, to those without such joints. In these figures

f is the clear flangeway required,
h is the width of the rail head,
C is the clearance at the heel of the switch between gauge lines,
T is the throw of the switch point,
P is the length of the planing at the switch point,
S is the length of the switch,
K is the number of the switch measured in units as in the case of a crossing,
R is the radius of the switch curve, where used.

All dimensions in the formulæ are to be in the same unit.

The first value to be obtained is that of P. For both straight and semi-curved switches

$$P = Kh$$

For a curved switch we must obtain P from the expression

$$h = \frac{P}{K} + \frac{P^2}{8R}$$

The values obtained apply whether there is a heel joint or not. For all three switches with a heel joint

$$\frac{T}{f} = \frac{S}{S-P}$$

Whence

$$S = \frac{TP}{T-f}$$

In the case of a straight switch we can get a value for C, which is useful, by putting

$$S = KC$$

and

$$P = Kh$$

Then

$$C = \frac{T \times h}{T - f}$$

Values of C when T = 4½ in.

f \ h	2¾	3
2½	5 37/52	6 1/2 9/13
2½	6 3/8	7 3/7

For a semi-curved switch

$$C = \frac{S}{K} + \frac{(S-P)^2}{8R}$$

For a curved switch

$$C = \frac{S}{K} + \frac{S^2}{8R}$$

A switch without a heel-joint bends as though it were a beam fixed at the virtual heel and loaded at the point. Its deflection curve is not the same as that of a beam of uniform section throughout its length. The planed portion bends more in proportion than the unplaned portion of the switch. The result is that near the planed portion the deflection varies almost in proportion to the square of the distance from the virtual heel. This is illustrated in Fig. 9. The length of the switch, S, can be obtained from the expression

$$\frac{S^2}{(S-P)^2} = \frac{T}{f}$$

$$\frac{S}{S-P} = \sqrt{\frac{T}{f}}$$

For many years all the switches for the

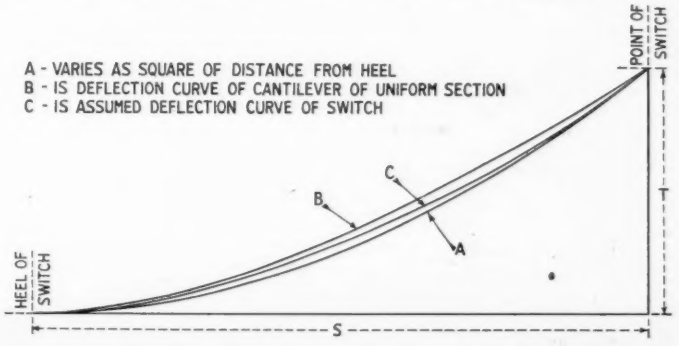


Fig. 9—Assumptions regarding deflection of switches without heel joints

turnouts for military railways in this country have been designed on this principle and have proved very satisfactory in use. Since 1925 they have had also a type of heel-joint which can be kept tight and still not interfere with the free movement of the switch. Straight switches are used.

When one attempts to check the values of the clear flangeway, f, of actual turnouts with the aid of the Permanent Way Institution book, "British Railway Track," one immediately comes up against a difficulty. At the bottom of page 43 of this otherwise excellent book one reads the sentence: "The switch rails pivot about a point known as the heel." As it stands this sentence is meaningless, because no mention is made anywhere in the book of the fact that some switches have a joint at the heel and others have no heel-joint, and the implications that follow. If there is a heel-joint the switch rails do pivot about the heel when the points are moved. If there is no heel-joint, moving of the points bends the switches between the heel and the point. The spaces available as flangeway between the switch rails and their stock rails are vastly different under the two different conditions.

As a rule the use of a heel-joint is restricted to straight switches, while all three types are used without heel-joints. The resulting values of f for three different switches taken from Table I on page 45 of the book are shown below. A switch point throw of 4¼ in. has been assumed.

Values of f in inches

Switch No.	Joint at heel	No joint at heel
18	1·65	0·64
30	1.65	0·64
+C	—	1·89

The straight switches without heel-joint will be very badly battered by every wheel flange which passes them, and the others will not be free from objectionable stresses which are unnecessary and could have been avoided if more thought had been given to their design. W.G.T.

Locomotive Limitations

(*Concluded from page* 483)

Probably the most up-to-date research on flange forces has been carried out in India under the Railway Board. A number of electrical strain gauges mounted on the locomotive axleboxes enabled continuous readings of the flange forces to be made at speed. Time, speed, and distance are also recorded, so that the exact location of any feature can be determined relatively to the track. Simultaneous readings can also be taken of the bogie, hind truck, or other controlling component.

Demands for increased power, calling for yet larger boilers to give steam for double power units, lead to the Fairlie, Kitson-Meyer, and Garratt types. In the Beyer-Garratt design the boiler barrel diameter is not restricted by driving wheel diameter, so that many more tubes can be got into the tubeplates, and the firebox width can be brought out to that of the loading gauge. The Americans, requiring much higher coal and water capacities, have developed their four-cylinder Mallet designs as tender engines.

In the Mallets it seems that the limits of the orthodox Stephenson boiler are being approached. Yet the Stephenson boiler is very hard to beat as a steam producer. Its limitations are, rather, its first cost and its high maintenance charges. The limit of working pressure, without resorting to special alloys, is about 300-320 lb. per sq. in. To overcome this limitation, Yarrow, Dobel, Velox, and La Mont boilers may be considered; some have been tried, but they have yet to prove their advantages in railway service. Again, the Schwartzkopff-Loeffler ultra high-pressure locomotive, in Germany, offered savings of nearly 50 per cent. in coal consumption, but only at the cost of greatly increased complication. On the Nord Railway, in France, an 18-cylinder geared locomotive has been tried, having a uniflow engine with cam-operated poppet valves and a dual-pressure boiler, the high-pressure unit working at 900 lb. per sq. in.

Sweeping statements such as "the day of the steam locomotive is done" are easy to make, but a "tree" diagram, in which the actual conversion of energy in the coal into drawbar h.p. is analysed, makes an interesting comparison with the electric locomotive. There is little to choose in overall brake thermal efficiency. Both work in the neighbourhood of 8 per cent., while the diesel-electric has been credited with 16 per cent.

Electric locomotive men are not free from limitations, however. Their anxiety about water level is not in a boiler but in a reservoir miles away. They have exchanged the excitement of a dropped fusible plug for that of a circuit breaker coming out if a bird misuses a high-tension insulator. Weather forecasts of thunderstorms, snow, or icing conditions are further anxieties. A fault in current supply can hold up a whole area. Overhead conductors hamper the driver's view, whilst the third rail has dangers to workers on the track.

The diesel locomotive, from humble beginnings, has now achieved main-line status. It, too, has limitations, chief of which is the need for a variable-speed transmission to enable it to exert full tractive effort at starting and to adjust its output over the speed range. Electric transmission naturally offered many advantages—it could suit either jackshaft or individual axle drive, was fully reversible, and gave excellent control. But it was heavy, complicated, and expensive, and needed special maintenance staff; a 350 h.p. engine, too, is needed for a 250 h.p. job, and the transmission efficiency seldom rises above 70 per cent. Yet America has almost exclusively adopted electric transmission; and indeed its big diesel-electric locomotives are practically mobile power houses.

Alternatives to electric transmission are hydraulic transmission and mechanical change-speed gearbox; recently the Freeborn automatic mechanical transmission, in conjunction with the Freeborn disc ring and coupling, has been developed. "Straight" mechanical transmission, though more efficient, involves a "break" when changing gear, so that a badly maniplated gear change can be very destructive, in view of the surge of power which then occurs, and components must be very massive to withstand it. The Wilson epicyclic gearbox, in conjunction with a Sinclair hydraulic coupling, enables the load to be transferred smoothly from one ratio to another and gives effective cushioning, and a reversal of torque breaks the hydraulic flow and gives a period of flexibility sufficient to take the peak off the surge.

But it is far better to avoid any brake of torque. The Freeborn power converter fulfils this condition. It is fully automatic, and the correct gear ratio is selected in accordance with the power demand for any combination of speed and load. The centrifugal friction clutch has the same anti-stalling qualities as the fluid flywheel and protects the engine against overload. This gear is being actively developed after successful trials on shunting locomotives up to 350 h.p.

Experience with hydro-mechanical transmission has shown its low efficiency at low piston displacements, and the torque converter method shows a steep falling-off in efficiency on each side of the maximum figure. But the S.S.S. Powerflow gearbox does seem promising; it avoids break of torque during gear changes by using a pneumatically-controlled friction clutch which picks up the torque and transmits power at engine speed while the selection of the new gear ratio takes place. An efficiency of 92 per cent. is claimed.

Finally, there are interesting developments in the direction of gas-turbine propulsion. The gas turbine locomotive would seem to be able to use cheaper fuels than the diesel, and if burning pulverised coal, would be attractive in coal-producing countries. The best thermal efficiency (as a locomotive) is given as 17 per cent., and if it could be operated near this figure it would have a substantial lead on the steam locomotive. The gas-turbine locomotive may become a competitor to the French geared steam locomotive and the turbo-electric locomotive which have efficiencies of 12 and 14 per cent. respectively. Like its diesel rival, it has great advantages in waterless countries, and (if oil burning) it has a greater range for given bunker capacity.

In conclusion, limitations are the signals along the track of progress. Read aright, they are route indicators to show us where we are on the right track. They give us warning when we have to proceed with caution, and pull us to a stop when the section ahead of us is blocked. I hope our survey has helped to show the way.

IMPROVEMENTS AT NEWCASTLE CENTRAL, L.N.E.R.—Under schemes which have received the general approval of the L.N.E.R. board, it is proposed as soon as circumstances permit to spend approximately £300,000 on improvements at Newcastle Central Station. The plan is in two parts, namely, the conversion of four of the bay platforms to two through platforms, and the provision of an additional platform and of a passenger subway to replace the existing footbridge; and the replacement of the signalling by a modern installation. The resignalling scheme is to be taken in hand first of all, and has already been approved in detail. The existing electro-pneumatic signalling, installed in 1906, is to be replaced by colour-light signals controlled from one signal box in the Central Station, thus enabling the present Newcastle Nos. 1, 2 and 3 and Manors Junction boxes to be closed. Route relay interlocking will be installed throughout the area, a system introduced by the L.N.E.R. at Hull in 1927 and at Northallerton two years later. An improvement introduced at Northallerton after experience with the Hull installation, and which will be embodied in the new installation at Newcastle, is the provision of special route lights on the control panel diagram to indicate the routes set up.

Unusual Tunnel Rebuilding

A 528-ft. length of a double-line tunnel has been recrowned from above with a vertical shaft and headings along the ridge of the old crown

IN 1926 a length of 528 ft. of Kingwood tunnel on the main line of the Baltimore & Ohio Railroad failed, though none of it actually fell in. The tunnel is about 1,580 yd. long, 31 ft. 4 in. wide, and 24 ft. 6 in. high from rail level to underside of crown. As the first drawing reproduced in the illustration on page 488 shows, the concrete vertical side walls—rising to a height of about 9 ft. above rail level—were undamaged, but the five-ring brick arch resting on them gave way in three places. The centre of the crown sagged to a maximum extent of 18 in., the crack opening to a maximum of 3⅝ in., and the two haunches were forced upwards to as much as 9¼ in. at the quarter points. Fortunately, there was an older single-line tunnel parallel to the double-line one that failed, through which additional traffic could be diverted temporarily while the damaged section of the double-line tunnel was being shored up; a very good job was made of this work. The arrangement of this shoring, carried out with 12-in. × 12-in. timbers, can be seen in the illustration.

Reasons for and Plan of Action

This shoring provided just sufficient clearance for even the big Mallet compound locomotives used on this heavily-graded section of line. To meet the great increase in wartime traffic, however, further enhanced motive power became necessary, and, in December, 1943, it was decided that the tunnel must be repaired to obviate the bottle-neck obstruction of the timbering. The plan of action selected was to retain the side walls and the segments of the brick arching from the springing to the quarter points, which, though their tops had moved outwards, were in good condition; the remaining central segments were to be removed and replaced by a new segment of concrete arching.

All the old packing and loose rock was also to be removed, and the haunches behind the brick arching were to be filled with concrete; all voids above the new concrete work were to be carefully packed with the old bricks removed from the part of the arch to be dismantled.

Contractors and Method Employed

The contract for this delicate work was let to the Bates & Rodgers Construction Corporation of Chicago, which, in agreement with the railway engineers, decided to carry out the whole of the work from the top, a decision mainly prompted by the clauses in the agreement, which specified that there must be (1) no interruption of the heavy traffic through the tunnel and (2) no possibility of further failure of the damaged part of the arch or of any rock fall that would result in blocking the tunnel.

Further support in favour of working from the top was the expectation of complications arising from remnants of abandoned coal-mining workings 20 ft. above the tunnel roof, and from heavy locomotive blast and exhaust gases, by reason of the 1 in 50 gradients in the tunnel; the summit was at its centre. Top working was possible without disturbing the existing shoring and with suitable pressure ventilation from above to drive the smoke out of the workings.

Accordingly, a vertical shaft 130 ft. deep was sunk from the surface down to the top of the tunnel arch over the centre of its 528-ft. damaged length. This shaft measured 11 ft. × 14 ft. and was timbered carefully throughout with sets of 10-in. × 10-in. timbers lapped and overlapped at the ends to resist thrust in all directions and spaced 5 ft. apart; the lagging consisted of 3-in. boarding. Cross struts also stiffened the timbering and divided the shaft into two vertical chambers; one was used as a cage hoistway, and the other as a manway and for concrete, pneumatic and electric services and other utilities. A 35-ft. timber headframe was erected for the cage hoist over the shaft.

From the foot of the shaft, 6-ft. × 7-ft. headings were driven outwards with extreme care along the ridge of the old brick tunnel arch. Drilling was mainly with jack hammers, and, to ensure as far as possible that the tunnel below would not be damaged, only light explosive charges were used. Square timber sets were fixed every 4 ft. or 5 ft., supported on cross sills resting on the tunnel arch and blocked to the tunnel lining at their ends.

Because much of the rock encountered was broken or faulted, every foot of each heading was driven with heavy timber crown bars cantilevered from one set to the next, thus guarding against any serious fall of rock. Mucking was by hand into tubs running on a narrow-gauge track carried along each heading on a solid wooden floor; the tubs were pushed to the shaft and hoisted to the surface.

Excavation from Headings

What is shown in the illustration as operation 3 was next begun from the outer ends of the two headings towards the central shaft. It consisted primarily of excavation simultaneously on both sides of each heading, step by step, each step including 10 ft. to 15 ft. of tunnel length. So sound was the old timber shoring below the damaged arch found to be, that it was considered quite safe temporarily to strut the rock above this excavation from the brick arching. The upper part of the excavation was carried high enough to remove all old packing and broken and loose rock, but its width was narrowed to about 3 ft. behind the springing of the arch, as will be seen from the illustration.

For the first or upper 8 ft., transversely from the heading, the cuts were driven with two sets of crown bars, supported by longitudinal timbers carried on struts placed normal to the surface of the old arching. Beyond 8 ft., crown bars were dispensed with, but the curving rock roof was well braced with posts and caps.

The next step, operation 4, was to fix at the correct position and inclination for subsequent timbering from the radial construction joints, the 12-in. × 3-in. wall plates shown in the illustration. Concrete was then poured into the lower part of the excavation, behind the haunches of the brick lining, until it came up to the height of these wall plates. Once this concrete had set, 12-in. × 12-in. timbers were erected on the wall plates to form segmental arch ribs spaced 3 ft. 6 in. apart (operation 5); there were seven timbers or segments in each rib. The strutting of the roof was then transferred from the brick arch to these segmental ribs, and the side posts of the heading were cut off and wedged on to the ribs. The heading floor was also removed, leaving a clear working space from haunch to haunch beneath the ribs. To complete operation 6, 2-in. timber lagging—carried on strips nailed to the sides of the rib timbers—was fitted between the ribs, so as to form a tight roof.

Removal and Replacement of Crown

Each successive 10-ft. or 15-ft. section was then ready for the removal of the central segments of the old brick arch between the quarter points (operation 7). The brickwork was broken up with pneumatic drills, and the bats were passed back and up to men working above the segmental roofing, who used them to fill all the space, including the upper part of the heading; the whole void was carefully back-packed (operation 8). The old shoring, previously below the arch, was now available to support centring for the new concrete central portion of the arch between quarter-points (operation 9).

Before the concrete was poured, however, a course of firebricks was laid on the centring to form a protection for the concrete from locomotive blast. The concrete arch, poured as operation 10, was 3 ft. thick, and over it was poured more concrete to fill the remaining space below the segmental ribs (operation 11). Finally, the centring and shoring were removed from within the tunnel.

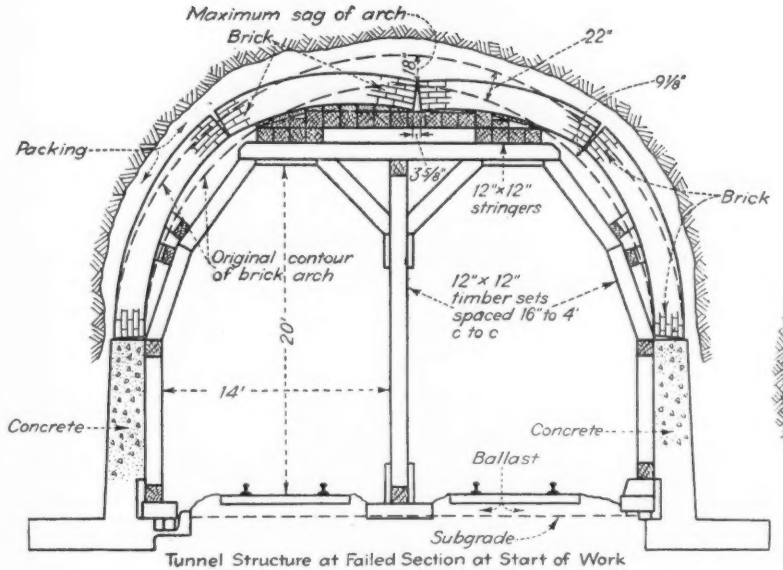
Anti-Smoke Pressure Ventilation

All this work was necessarily slow, as it had to be carried out very carefully, step by step, and considerable lengths of working chamber were open at any one time at the ends of the headings. The heavy traffic kept the tunnel almost continuously full of smoke for long periods, so that the only way to make nearly-continuous working possible was to bring in air from the top of the shaft under pressure. A 48-in. centrifugal fan running at 1,150 rev. per min., driven by a 50-h.p. motor, forced 15,000 cu. ft. of ventilation air per min., through a 26-in. steel pipe down the shaft and two 16-in. fabric tubes, one along each heading, where it was delivered at a pressure of 2 lb. per sq. in.

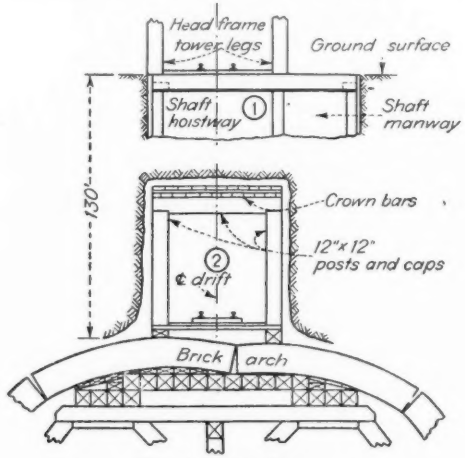
This pressure was sufficient to keep out the smoke from the workings except when trains were passing. A watchman was posted to give warning of the approach of each train and so allow the labour to take refuge in the headings, the ends of which were fitted with swing doors to exclude the blast. Within a couple of minutes of the passing of a train the fresh-air pressure had forced the smoke back into the tunnel, so that no very long interruption of work was caused.

All concrete was mixed at the top of the shaft and pumped thence directly to place of pouring, a method that proved very satisfactory in filling voids in the haunches and back-fill above the arch.

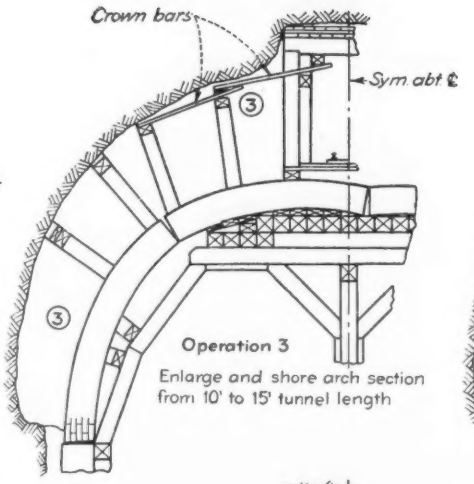
Work began on the shaft-sinking in March, 1944, and both headings had been driven by August in that year. The remainder of the work was completed during the end of 1944 and early in 1945. It was carried out under the supervision of Mr. A. C. Clarke, Chief Engineer, B. & O. RR., and his staff, according to our American contemporary *Engineering News-Record*, to which we are also indebted for the illustration reproduced. Some historical information about this tunnel will be found on page 474.



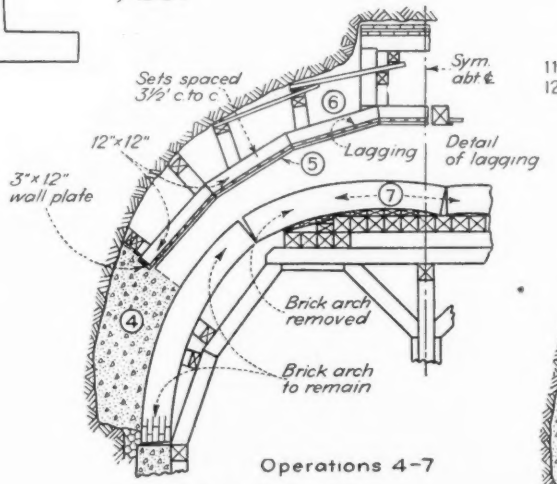
Tunnel Structure at Failed Section at Start of Work



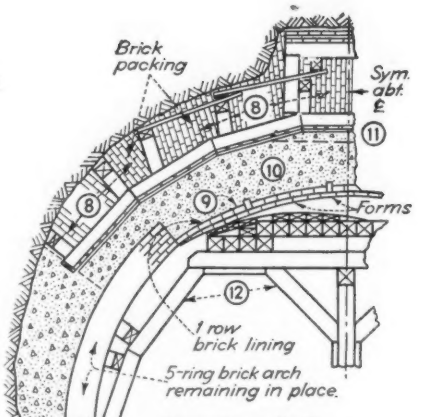
Operations 1 and 2
1–Sink 130' shaft to top of old arch
2–Drive 6'×7' crown drift full length failed section



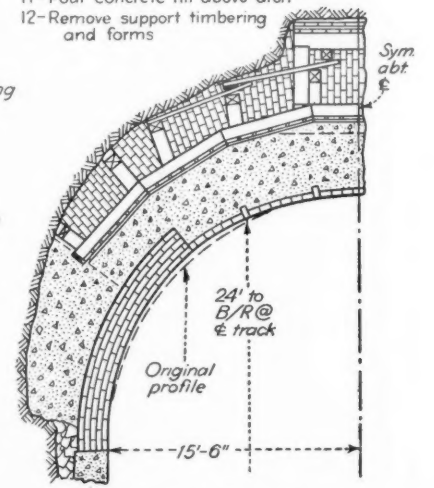
Operation 3
Enlarge and shore arch section from 10' to 15' tunnel length



Operations 4–7
4–Pour haunch concrete
5–Install 7-segment timber sets 3½' c.to c
6–Transfer roof supports and top of drift to segment timbering
7–Remove center sections brick arch leave haunch section in place



Operations 8–12
8–Back pack all areas above lagging with old brick
9–Build forms for arch and line with fire brick
10–Pour concrete arch
11–Pour concrete fill above arch
12–Remove support timbering and forms



Cross Section of Completed Arch

Cross-sections showing the damaged arching and successive stages in the work of replacement. *(See article on previous page)*

Signalling Practice on Canadian National Railways

A description of the centralised traffic control system at Moncton, New Brunswick

(From a Correspondent)

THE signalling system of the Canadian National Railways uses interlocking for the authorisation and protection of movements over a number of routes, and also for the protection of grade crossings, drawbridges and some junctions, while automatic signals are used for one-way running on double track and for two-way running on single track, the latter being controlled on the so-called absolute-permissive system. A combination of these is used in centralised traffic control, where the interlocking signals at junctions and sidings operate in conjunction with absolute-permissive signalling.

At Moncton, New Brunswick, an important east-coast junction of C.N.R., I watched the centralised traffic control in operation, and its working was explained to me by Mr. Walter U. Appleton, retired Vice-President and General Manager, Eastern Division, C.N.R.

The system controls 185 miles of track from Catamount, just outside Moncton, *via* Truro to Windsor Junction, near Halifax, Nova Scotia. When installed in 1942, the C.T.C. system met an urgent need, speeding the swelling war traffic to and from Halifax, vital seaport for war exports, and controlling the only rail communication between Halifax and other parts of Canada. Traffic was very heavy, because the single track from Moncton to Halifax carried all traffic from three lines converging on Moncton, two from Montreal, and one from Saint John, New Brunswick.

Physical obstacles, notably difficult grades and curves between Truro and Moncton, impeded increased speed and traffic capacity. Only 26 miles in four short stretches were double track, and passing oncoming trains and waiting for orders necessitated long stops in sidings, sometimes for an hour. Now, guided by a movement chart, controllers handle all movements by signal indication only, so that trains meet with the minimum delay, thus increasing the overall speed of freight trains. The total movement at present averages 30 a day.

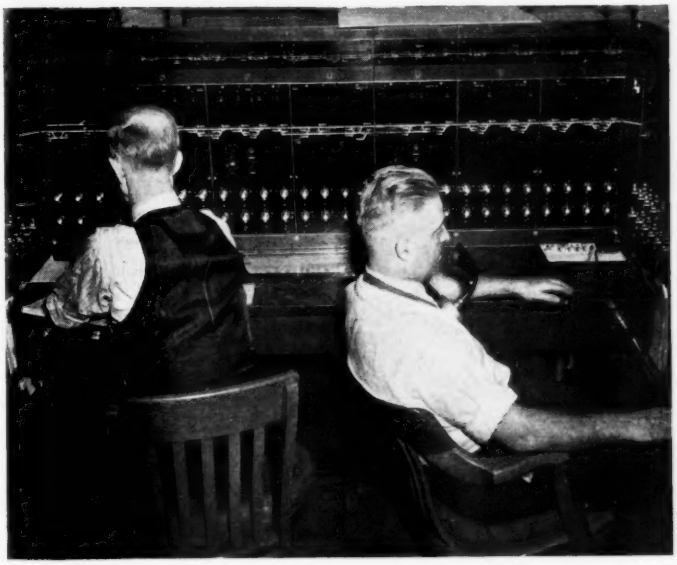
Particularly suited to busy single track lines, centralised traffic control has materially increased traffic capacity, and could take care of some 50,000 tons a day each way, in addition to the passenger trains, over the portion with the heaviest grades, where the overall speed of freight trains increased 20 per cent. and running costs were appreciably reduced.

Control is from Moncton and Halifax, dividing at Truro, 125 miles and 48 miles respectively, and this is how the system works. In the control room at Moncton, two controllers with chest phones sit before a bay shaped control panel about 6 ft. high. The track is embossed in white on a black panel, which shows station names, junctions, both ends of sidings, and intermediate distances. There are two small levers under each controlled point, the bottom for track switches and the top for signals, both determining the proper code to be sent to the selected point for the power operation of the switch or signal, open and closed, through and stop. According to the indications appearing on the panel showing the location of other trains the controller moves the levers to clear signals ahead of the trains.

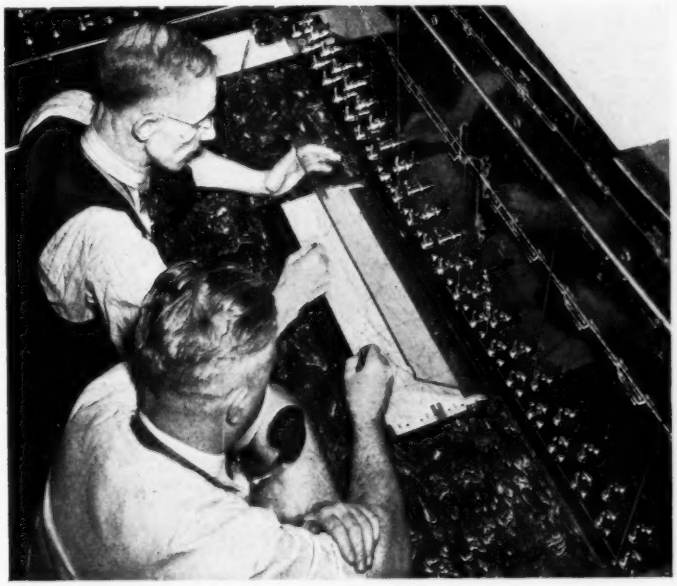
A moving chart is mounted on a desk, and when trains cross track-circuit sections at the control points, a pen burns holes in the control room chart, recording the positions and times of the trains. Lines joining the holes trace continuous train movements. Charts are renewed every day and filed with engine numbers and running reports. No train orders are given, train movement being entirely by signal indication, thus eliminating many waits.

A controlled signal automatically blocks the line when the signal ahead is cleared for an opposing movement. With the track already occupied a controlled signal goes to "Stop" when the cleared train passes and remains there until cleared by the controller. Some 150 trackside and station telephones connect the train employees with the controller, to advise work on hand, train departure time, inability to signal "Clear" and to help the controller save time by preliminary planning. Track occupancy lights indicate train movements.

At Springhill Junction, where there is an automatic safety switch, the controller and trainman co-operate to clear the line. Moving a button, the controller orders the trainman to disengage a lever, which reverses the automatic switch and clears



Traffic control room at Moncton, New Brunswick, showing diagram round wall and signal controls beneath



Operators in the central traffic control room working on a chart showing train movements

Cross-sections showing the damaged arching and successive stages in the work of replacement. (See article on previous page)

the signal. The switch automatically returns to "safe" after the train has passed.

One controller in Halifax handles trains between Halifax and Truro, but two are required in Moncton for the Truro-Moncton sector, because of its greater length and the necessity for two wire circuits to carry the code impulses.

Almost all switches at controlled points are power operated, the exception being at a few sidings, where switches are used infrequently near power operated sidings. Spring switches are used at these points. All signals are electrically operated, and are of the searchlight pattern. "Entering" signals have three units, namely, through, caution, and enter siding (slow speed); "leaving from the main track" has two units; and "from the siding" are one-unit low signals. "Entering" signals at spring-switch sidings use an additional letter "S" to order the hand operation of a switch before entering the siding. All signals stand on the right of the tracks they govern.

Since the installation of centralised traffic control there have been no accidents through disobedience to signals. During journeys between Halifax and Moncton our train never waited longer than five minutes at stations and was not once shunted into sidings. Our travelling time averaged 7 hours 9 minutes for about 200 miles.

The General Railway Signal Company, Rochester, N.Y., U.S.A., supplied the equipment and made the installation under the supervision of Mr. R. G. Gage, Chief Electrical Engineer, C.N.R.

The automatic signals are of the usual three-aspect type and revert automatically to "Stop" when the track is occupied. The signals in advance control them to "Caution" or "Proceed," and all are electrically operated, using d.c. or a.c., usually a.c. because commercially purchased supplies are cheaper than power from primary batteries. Automatic signals control the double track between Halifax and Windsor Junction, Nova Scotia, where the centralised traffic control ends, and all the way from Montreal to Chicago.

Interlocking signals govern train movements over conflicting routes, such as junctions, railway grade crossings and interlocked drawbridges. These signals are electrically or mechanically controlled, and a red-yellow "caution" is also incorporated, to "proceed at driver's risk." Use of low signals in Montreal and Toronto Terminals prevents confusion with overhead cables and is considered to increase track capacity.

A clear home signal cannot be given until all switches on the route are locked in proper position and all signals controlling crossings or opposing routes are at "Stop." Remote control, from a central point, is *via* switches and signals, and lights on the track diagrams show train movements. Major interlocking controls are installed at St. Lambert and Montreal, as described in *The Railway Gazette* for February 22, 1946, and they are also in use at Toronto.

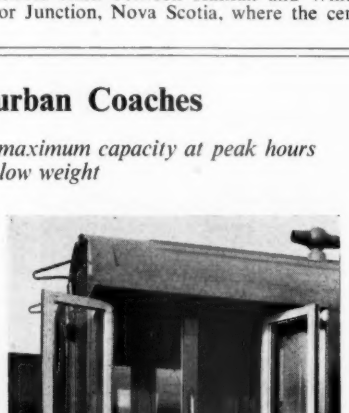
New Danish Suburban Coaches

Centre-corridor vehicles designed for maximum capacity at peak hours combined with low weight

A NEW type of suburban coach has been introduced by the Danish State Railways for service between Copenhagen and Hillerød. Each coach has a centre corridor, and is divided into a smoking saloon with 48 seats and a non-smoking saloon with 38 seats. There is another compartment, which has only one seat, and this is either used by the guard or set aside for mothers with babies. All compartments have leather-upholstered high-backed seats on spring frames. At each end of the coach there is a large platform with double doors, permitting rapid loading and unloading. As these coaches are used on lines with very heavy Sunday and holiday traffic, the large end platforms are useful for standing passengers.

In peak hours one coach will hold nearly 200 passengers. The ceiling at the end platforms is not continuous with that in the remainder of the coach, but is formed by the curved roof itself, which provides additional height for skiers to carry their skis.

The coaches have been partly reconstructed from older vehicles. A number of coaches acquired about 30 years ago needed heavy repairs to the wooden bodies, although the bogies were still in excellent condition. Therefore the old bogies have been used with new steel bodies, built by the Scandia Works in Randers, Denmark; the seating and upholstery work has been carried out by the Danish State Railways.



View through double doors showing the entrance vestibule

Every possible means of reducing the weight of the coach has been adopted. The bodies are welded, and light metal has been used where possible. The coaches have compressed air brakes. The weight of a car is only 28 tons 5 cwt., which means that the weight per seat is only about 6 cwt., while the older suburban coaches still in use weigh about 8 cwt. per seat.

The new coach, which is much stronger than the older type, thus entails a saving in weight of 23 per cent., and in addition has standing room for many more passengers.

Besides this new passenger coach, known as type "CL," a new coach with a luggage compartment, type "CLE," has also been introduced. This vehicle provides 61 seats.

Normal trains with this type of stock are formed of seven coaches of type "CL" and one of type "CLE." During peak hours such a train will hold about 1,500 passengers. In all, 42 coaches of type "CL" and 6 of type "CLE" have been put into service on the Danish State Railways.

Danish State Railways steel-body suburban carriage mounted on bogies re-used from an older type of vehicle

RAILWAY NEWS SECTION

PERSONAL

L.M.S.R. Vice-Presidents

The L.M.S.R. announces that Mr. F. A. Pope, C.I.E. (Chief Commercial Manager), and Mr. R. A. Riddles, C.B.E., M.I.Mech.E., M.I.Loco.E. (Chief Stores Superintendent), have been appointed Vice-Presidents of the company.

British Railways General Traffic Manager, New York

The railways announce that Mr. T. D. Slattery, who has been temporarily in charge of their New York Office, has now been appointed to the permanent position of General Traffic Manager, Associated British & Irish Railways Incorporated. He has just returned to New York after a visit to this country. A portrait and biography of Mr. Slattery appeared in our February 4, 1944, issue.

Sir Charles Bruce-Gardner has been appointed a Director of Crompton Parkinson Limited. Mr. E. C. Holroyde has been elected Vice-Chairman of the company.

Lord Rothschild and Mr. H. L. Newlands have been appointed Directors of the British Overseas Airways Corporation.

We regret to record the death on April 24, at the age of 72, of Mr. John Edward Humphery, a Managing Director of the Proprietors of Hay's Wharf Limited.

Mr. Frank G. Bird has resigned the Directorship he held in the companies of Jarvis Industries Group, as it is his intention to take up other interests.

Mr. Harry Williams, Senior Draughtsman, Chief Mechanical Engineer's Department, South African Railways, is in England in connection with the construction of railway coaches by the Metropolitan-Cammell Carriage & Wagon Co. Ltd. for use by the King and Queen when they visit South Africa next year.

South African Railways & Harbours

Mr. I. Broll, Superintendent (Commercial & Staff), East London, has been appointed Superintendent (Commercial & Staff), Cape Town.

Mr. F. Martin, Port Goods Superintendent, Port Elizabeth, has been appointed Port Goods Superintendent, Cape Town.

Mr. W. W. E. Rawlinson, Superintendent (Commercial & Staff), Bloemfontein, has been appointed Superintendent (Commercial & Staff), Durban.

Mr. A. S. Manchip, Assistant Superintendent (Staff), General Manager's Office, Johannesburg, has been appointed Superintendent (Commercial & Staff), East London.

Mr. W. W. Shutt, Assistant Superintendent (Commercial & Staff), Johannesburg, has been appointed Superintendent (Commercial & Staff), Bloemfontein.

Mr. R. P. Hardy, Assistant Superintendent (Operating), Durban, has been appointed Superintendent (Operating), Port Elizabeth.

Mr. T. F. Cameron, M.Inst.T., Acting Divisional General Manager (Scottish Area), L.N.E.R., who, as recorded in our April 26 issue, has been appointed Divisional General Manager (Scottish Area), was born in 1890, and was educated at George Watson's College and the University of Edinburgh. He joined the North Eastern Railway as a traffic apprentice in 1912. After serving during the 1914-18 war with the Directorate of Light Railways in France, he was demobilised with the rank of Major, R.E. In 1926 he became Mineral Traffic Controller, Hull, L.N.E.R.; and in 1929 he was appointed Dock Superintendent, Tyne Dock. He was made Assistant District Goods Manager, Newcastle-on-Tyne, in 1931, and two years later became Assistant District Superintendent there. In 1934 Mr. Cameron was appointed Staff Assistant to the Superintendent, York, and in 1935 he became Assistant to the Divisional General Manager (North Eastern Area). He was appointed Assistant Divisional General Manager (North Eastern Area) in 1936. Early in 1943 he was made Assistant to the Chief General Manager (Works), and later in the same year became Assistant General Manager (Works & General). During 1943-44 Mr. Cameron acted as Divisional General Manager (Scottish Area) during the absence of Mr. R. J. M. Inglis in India; and he has been acting again in that capacity since Mr. Inglis left for Germany last year on Government service. Mr. Cameron is a Member of Council of the Institute of Transport. He has always taken a special interest in the training of young men; and he is the author of a book, "An Outline of Railway Traffic Operation," recently published by the Railway Publishing Co. Ltd., which bears evidence of his understanding of the problems of the young student of railways.

Mr. T. F. Cameron

Appointed Divisional General Manager (Scottish Area), L.N.E.R.

Mr. D. S. Robinson, O.B.E., General Sales Manager, Sports Division, Dunlop Rubber Co. Ltd., has been appointed Sales Director of the company in South Africa. He is succeeded by Mr. R. C. Hiam, O.B.E., Deputy Regional Manager for the South of England. Both Mr. Robinson and Mr. Hiam rose to the rank of Brigadier during the war and each received the O.B.E. for his services.

Mr. Ralph S. Griffiths, formerly Assistant Manager of McKenzie & Holland Limited, and afterwards Sales Engineer (Signals) with the Westinghouse Brake & Signal Co. Ltd., has retired from the service of the latter company. He is a Past-President of the Institution of Railway Signal Engineers.

The Council of the British Engineers' Association has invited Mr. S. F. Steward to fill a casual vacancy on the Council created by the resignation of Mr. F. Ayton, consequent on his retirement from active business.

The following announcement appears in the Supplement to *The London Gazette*, dated March 26, 1946, under the heading of Regular Army—Corps of Royal Engineers:—

The undermentioned Major (War Substantive Lt.-Colonel) to be Lt.-Colonel:—

November 28, 1945:—

C. G. B. Greaves, C.B.E. (6885).

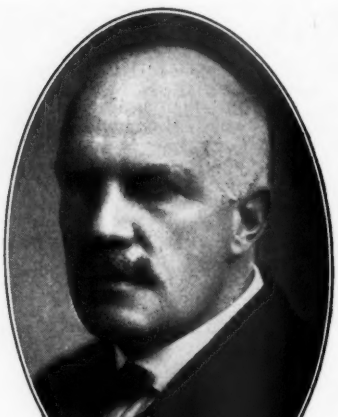
The following announcement appears in the Second Supplement to *The London Gazette*, dated April 12, 1946, under the heading of Regular Army:—

Colonel C. S. Napier, C.B.E. (27784), retires on retired pay, April 11, 1946, and is granted the honorary rank of Major-General.

Mr. J. O'Neill, who, as recorded in our April 26 issue, has been appointed Advertising & Publicity Officer, L.M.S.R., entered the company's service in 1928, when, as an expert in business organisation and administration, he was invited by the late Lord Stamp to participate in a survey of the company's methods and procedure in respect of printing and stationery requirements. The outcome was the establishment at Euston and Crewe of the Executive Research Office, which, after an exhaustive survey, was responsible for the introduction of new and economical methods for the provision and distribution of all the railway's printed matter and stationery. In 1936 Mr. O'Neill assumed sole charge of the Executive Research Office, a position which he retains concurrently with his appointment as Adver-

Mr. J. O'Neill

Appointed Advertising & Publicity Officer, L.M.S.R.



Mr. F. W. Harris

Divisional Locomotive Superintendent, Oswestry, G.W.R., 1932-46

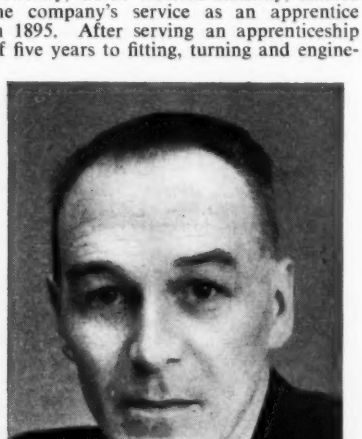
Mr. H. G. N. Read

Appointed General Assistant to Chief Commercial Manager, Watford H.Q., L.M.S.R.

tising & Publicity Officer. In 1939 he undertook a fresh survey of the printing and stationery position in the light of war circumstances, and was responsible for several important wartime developments, including the establishment of special paper reclamation depots at London and Glasgow. Throughout his service with the company he had frequently acted in a consultative capacity in respect of advertising and publicity matters; and he was appointed to act as Advertising & Publicity Officer during the serious illness of the late Mr. G. H. Loftus Allen in 1944, and subsequent to the latter's death in August, 1945.

Mr. F. W. Harris, M.I.Mech.E., Wh.Ex., who, as recorded in our April 5 issue, retired on April 29 from the position of Divisional Locomotive Superintendent, Oswestry, Great Western Railway, entered the company's service as an apprentice in 1895. After serving an apprenticeship of five years to fitting, turning and engine-erecting in the locomotive works at Swindon, he was transferred to the drawing office. While there he obtained the G.W.R. Chairman's Prize for Engineering and a Whitworth Exhibition. In 1920 he was transferred to Old Oak Common engine shed as a Technical Inspector, and in 1924 was appointed Assistant to the Divisional Locomotive Superintendent at Oswestry, where he became Divisional Locomotive Superintendent in 1932. Mr. Harris recently was admitted to the Order of St. John of Jerusalem in the grade of Serving Brother.

Mr. H. G. N. Read, M.Inst.T., Assistant to Chief Commercial Manager (Passenger), Watford H.Q., L.M.S.R., who, as recorded in our April 12 issue, has been appointed General Assistant to the Chief Commercial Manager, Watford H.Q., entered the service of the L.N.W.R. in 1907. He joined H.M. Forces in August, 1914, and served successively with the R.N.V.R., R.N.A.S., and in the Army, and was mentioned in despatches. He retired from the Army in 1919 with the rank of Major; he held the appointment of Deputy Assistant Director of Inland Water Transport in France. He returned to railway service, and, after a period in the department of the General Superintendent (Passenger Commercial) was appointed in 1931 Assistant District Passenger Manager, London. He became Road Transport Assistant to Chief Commercial Manager in 1932. Road & Air Transport Assistant in 1936, and Assistant (Road & Air Transport & General) in 1938; his responsibilities in the last-named appointment embraced the Claims Departments of the L.M.S.R. He was appointed Assistant to Chief Commercial Manager (Passenger) in 1942. Mr. Read has held the appointment of Commercial Manager, Railway Air Services Limited; he is Chairman of Isle of Man Air Services Limited and a Director of other air transport companies. He is a Director of several L.M.S.R.-associated bus companies, and a member of the

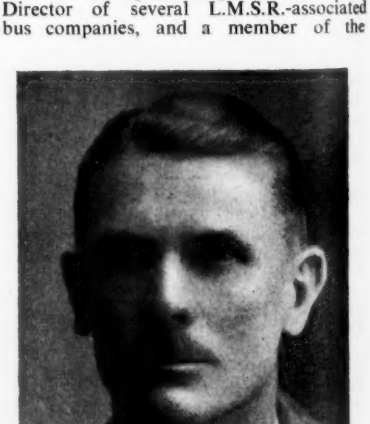


Mr. W. S. Wildman

Appointed Assistant Works Superintendent, Carriage & Wagon Works, Derby, L.M.S.R.

Mr. W. T. Geden

Appointed Stationmaster, Paddington, G.W.R.



Mr. L. B. Norrish

Appointed Chief Mechanical Engineer, Central Uruguay Railway

Railway & Municipal Corporation Joint Omnibus Committees at Sheffield, Huddersfield and Halifax. At each place he has occupied the chair in the L.M.S.R. recurring annual terms. He is currently Chairman of the Sheffield Joint Committee.

Mr. W. S. Wildman, who, as recorded in our March 8 issue, has been appointed Assistant Works Superintendent, Carriage & Wagon Works, Derby, L.M.S.R., joined the company as an apprentice in 1917 at Wolverton Carriage & Wagon Works. In 1924 he obtained the Sir Richard Moon Scholarship and studied at Liverpool University until 1927. On resuming at Wolverton Works he gained experience in the drawing office, progress office and production shops. In 1942 Mr. Wildman was promoted to be Assistant to Works Superintendent for Plant & Machinery, and he became Assistant for Carriage Maintenance in 1945. He was transferred to Derby Carriage & Wagon Works as Assistant Works Superintendent on April 1 last.

Mr. W. T. Geden, Stationmaster, Reading, Great Western Railway, who, as recorded in our April 5 issue, has been appointed Stationmaster, Paddington, entered the company's service in 1907 in the Traffic Department (London Division). After service at a number of stations, he was transferred to the Divisional Superintendent's Office at Paddington in 1911, and subsequently was appointed a relief clerk and, in 1930, an outdoor representative. Mr. Geden returned to the relief staff in 1936 as a Relief Stationmaster, and was appointed Stationmaster at Reading in February, 1942.

Mr. L. B. Norrish, A.M.I.Mech.E., M.I.Loco.E., who recently was appointed Chief Mechanical Engineer, Central Uruguay Railway, was trained in the L.S.W.R. shops at Eastleigh from 1917 to 1924. Mr. Norrish was appointed Assistant to the Chief Mechanical Engineer of the Central Uruguay Railway, in 1924, and in 1935 became Assistant Chief Mechanical Engineer, Central Railway of Peru, a position he held until 1939. Mr. Norrish volunteered for the Army at the outbreak of war, was accepted in the Royal Engineers (Transportation), and became Officer in Charge of Workshops at No. 2 Railway Training Centre, Derby. From January, 1941, to December, 1942, he was at the War Office as Staff Captain and later as D.A.D.Tn. He took command of 206 Railway Workshop Company on its formation. He became Second-in-Command of No. 3 Railway Workshop Group in July, 1943, took command in June, 1944, and left it in Holland for demobilisation in July, 1945.

The Secretary of State for Foreign Affairs has given notice of the following amendment of the list of persons on whom immunities and privileges have been conferred by the Diplomatic Privileges (the Transport Organisation Amendment) Order in Council, 1945 (see *The Railway Gazette* of March 15):—

Representative of Member Government on the Council of the European Central Inland Transport Organisation: *Add*: Mr. Wilhelm Eickhoff (Denmark).

The John Ericsson Medal for distinguished engineering and scientific achievements has been awarded to Dr. Sven Wingquist, Chairman of S.K.F. Aktiebolaget Svenska Kullagerfabriken (Swedish Ball Bearing Company). The medal was instituted in 1926 by the Society of Swedish Engineers in America, and is awarded every second year, alternatively to an American and a Swedish scientist.

We regret to record the death on April 21 of Mr. George Woodvine, M.B.E., Managing Director of Sentinel (Shrewsbury) Limited.

Mr. P. G. Robinson, M.B.E., retired from the position of Assistant Manager, Great Western Railway Hotels & Catering Department, on April 30, after nearly 50 years' service with the company.

Southern Railway Appointment

Chief Accountant's Office

Mr. W. H. Appleton, Special Auditor, Chief Accountant's Office, to be General Assistant (Auditor).

Indian Railway Staff Changes

Mr. V. P. Bhandarkar, Railway Liaison Officer, Calcutta Area, will succeed Mr. R. G. Manson as General Manager, B.A.R., when the latter proceeds on leave preparatory to retirement early this month.

Mr. S. J. P. Cambridge, who joined the B.N.R. from the E.I.R. last September, and was posted as Deputy General Manager (Food & Planning), has been appointed to officiate as General Manager, B.N.R., in succession to Mr. W. R. FitzGerald, granted leave preparatory to retirement as from January 16.

Mr. P. R. Leigh-Bennett, Transportation Manager, B.N.R., proceeded on leave in January preparatory to retirement.

Mr. A. M. Clark has been permanently confirmed as Commercial Traffic Manager, B.N.R.

Mr. G. C. K. Jolley has been appointed to officiate as Controller of Stores, B.B.C.I.R., as from January 26.

Mr. E. G. E. Paddon has been confirmed permanently as Chief Electrical Engineer, E.I.R.

Mr. W. de Bruyn has been appointed to officiate as Chief Electrical Engineer, M.S.M.R., as from January 1.

Mr. P. Morris has been appointed to officiate as Chief Mechanical Engineer, M.S.M.R., as from January 1.

Mr. H. M. Walker, Officiating Chief Mechanical Engineer, N.W.R., has been granted 28 months' leave preparatory to retirement as from March 4. Mr. H. M. R. Morse, on return from leave, has been appointed to officiate as Chief Mechanical Engineer.

Rai Bahadur P. C. Khanna, Divisional Superintendent, Multan, N.W.R., has been appointed to officiate as Chief Engineer, in place of Mr. J. E. Heining, who proceeds on leave preparatory to retirement on May 9.

Mr. D. M. Hambly, Deputy General Manager, N.W.R., proceeded on six months' leave from March 30. Khan Bahadur A. S. Faruqui has been appointed to officiate in his place.

Mr. H. E. Thompson, Chief Engineer, S.I.R., returned from leave and resumed his duties on January 18, relieving Mr. B. S. Chetti, granted two years' leave preparatory to retirement.

Mr. H. A. Reid, Chief Mechanical Engineer, S.I.R., has been granted two years' leave preparatory to retirement, as from January 1. Mr. W. R. Oaten has been appointed to officiate as Chief Mechanical Engineer.

Mr. H. C. Hodgson, Signal & Telegraph Engineer, S.I.R., has been granted 1 year and 10 months' leave preparatory to retirement as from January 1. Mr. C. A. White has been appointed to officiate as Signal & Telegraph Engineer.

Mr. H. J. Crane, Chief Commercial Superintendent, S.I.R., has been granted two years' leave preparatory to retirement as from January 1. Mr. C. M. Dodge has been appointed to officiate as Chief Commercial Superintendent.

Mr. W. G. W. Reid has been confirmed as Director, Mechanical Engineering, Railway Board.

We regret to record the death on April 30, at the age of 70, of Sir Murrough J. Wilson, K.B.E., Deputy-Chairman of the London & North Eastern Railway Company since 1934.

The late Lord Plender, who was Senior Partner in Deloitte, Plender, Griffiths & Company, and a Stockholders' Auditor of the Great Western Railway Company, left £325,787.

Mr. Arthur Arnold, A.M.I.Mech.E., A.M.I.E.E., Editor of our associated journal *The Power & Works Engineer*, and Consulting Editor of *Colliery Engineering* and *Coke*, has been elected a Member of Council of the Institute of Fuel, of which he is a founder member.

Among those recently appointed Sheriffs in England and Wales are Sir William Currie (Director, Southern Railway Company) (Buckinghamshire); Sir Patrick Ashley Cooper (Member, London Passenger Transport Board) (Hertfordshire); and Sir Willie Reardon-Smith (Director, Great Western Railway Company) (Glamorgan).

The Minister of Labour & National Service has appointed Mr. Moelwyn Hughes to be Chairman of the Catering Wages Commission in succession to Sir Hartley Shawcross.

L.M.S.R. Ambulance Competition

The first post-war Ambulance Shield final competition of the L.M.S.R. took place in the Kings Hall, Belle Vue Gardens, Manchester, on April 26. The judges were Dr. F. H. Edwards, M.B., Ch.B., M.R.C.S., L.R.C.P., F.R.C.S. (Shrewsbury); Dr. P. L. Regan, M.B., Ch.B. (Liverpool); and Dr. R. Scott Reid, M.B., Ch.B. (Bath). The following teams took part:—

Agecroft (Locomotive)
Wyre Dock (Fleetwood)
Bristol
Camden
Peterborough
Warrington
Bolton Locomotive
Uttoxeter
Crewe Machine Shop "B."

The total possible points were 405, and the winners were:—

Uttoxeter (score : 336)
Bolton Locomotive (score : 319½)
Crewe Machine Shop "B" (score : 318½)

At the prize-giving ceremony the chair was taken by Mr. H. J. Comber, Chief Officer for Labour & Establishment, L.M.S.R., and the prizes were presented by Sir Robert Burrows, Chairman of the company, who spoke very highly of the excellent work carried out by the Ambulance Section of the L.M.S.R. throughout the war and the doctors who had given their services in training the members during that hard-pressed period.

The guests were entertained to luncheon and tea by the L.M.S.R.

Institution of Railway Signal Engineers

At a meeting of the Institution of Railway Signal Engineers in London on April 17, Mr. R. S. Griffiths, Past-President, read a paper entitled "Upper-Quadrant Signals: Some Reflections." The paper referred to the question of visibility, amount of display area, ease of locating signals with respect to the track, return effect and counterbalancing, and included many historical references covering the use of the upwardly-moving semaphore in other countries.

Mr. H. H. Dyer, the new President of the Institution, was in the chair.

Mr. H. E. Morgan, Past-President, opening the discussion, although agreeing with the author's views, thought he had omitted some of the advantages of the upper-quadrant design. The green glass was shielded from extraneous light. The position of lamp and spectacle centre did not have to be altered for a thicker post. The torque was a gradually-rising one and was greatest towards the end of the movement, where there was the greatest return effect, and the outline of the arm relative to the post was greater there. In the lower-quadrant signal, especially if the arm fell near the post, the profile in the off position was poor. He thought it was incorrect to say that the U.Q. arm often gave an unsatisfactory off indication, and considered it came off to a more consistent angle with a slack wire than did the L.Q. types, although admittedly the old Midland signals had had the characteristic of coming off well with a slack wire, due to the way the pin in the down-rod had been located. He had not experienced a greater number of cases of freezing with the U.Q. arm. L.Q. arms had been known to fail from heavy snow overcoming the balancing effect.

Mr. T. Guest thought the paper ably set out the advantages and disadvantages of the two types. The expectations of the sub-committee of signal engineers appointed by the Railway Executive Committee in 1919 had been fully confirmed. The shielding of the green glass by the post was a good feature of the design; with the older signals some lines provided special shades to do this.

Mr. D. L. Champion, speaking as a meteorologist, thought the exposure of the spindle to night radiation and the accumulation of sleet, snow, rime and hoar frost on the bearing might render the U.Q. design more liable to freeze in the off position. With the L.Q. designs in which the spindle went through the post the wood had the effect of delaying the chilling of the spindle.

Mr. L. J. Boucher did not think there was any practical difference in the display areas of the U.Q. or L.Q. designs. Drivers could be saved from having to look all over the place for the signals by the placing of them intelligently. Freezing with the U.Q. arm was no more frequent than with other types, but at first the design had not been all it might be and there was a space by the spindle where water could collect and freeze. That had been rectified.

Lt.-Colonel E. Woodhouse wished to say something for the downward moving arm, as he could not agree with what Mr. Morgan had said about visibility under all conditions. With the old signals the fact that one got a clean-cut angle between arm and post on the left-hand, both when on and off, was a great help in picking out a signal from among such objects as telegraph posts. In the U.Q. design that part of the signal was cluttered up with the lamp and fittings. He felt that the eye would more readily pick up the L.Q. arm making an acute angle with the post than the U.Q. making an obtuse angle. In many cases the U.Q. arms were mounted too high on the posts.

Mr. A. E. Walker thought that the old Midland-type arm offered much less opportunity to freezing than the present U.Q. design.

Mr. S. Williams was entirely in favour of the U.Q. design, but had found it to have a few disadvantages under certain conditions.

The President, in moving a vote of thanks to Mr. Griffiths, said that some of the criticism of the U.Q. arm came from condemning a new thing before it had got through its teething troubles. At first the design of the bearings and spindle fitting had not been good enough. There had been too many pieces, and in fixing the equipment to a wooden post it was possible to bend the castings and produce a tightness in the bearings which showed itself later. Those defects had been rectified.

The present design was sound and solid. They had the equivalent of a bearing at each end of the spindle with a clearance to hold oil. It was not lack of oil so much as the presence of water that produced the liability to seize in low temperatures. The way to keep water out was to get oil to remain in, but a thick oil that would remain in was liable to get sticky in cold weather. Equally a thin oil was liable to run out during the hot weather.

They now sealed the ends of the spindles, and they had an oil under trial which bade fair to bring them out of their troubles. In very exposed situations, they got freezing outside the bearings, where sleet and snow caked up and formed a bridge of ice; but that could happen with other designs. There was no doubt the old Midland signal offered less opportunity than others for sleet to blow into the spindle fittings. Most cases of freezing off were due to parts seizing in the transmissions, and not to trouble at the arm itself.

With the slim type of tubular post now being standardised he thought the arms stood out very well to view.

Replying to the vote, Mr. R. S. Griffiths said his hearers seemed satisfied there was plenty to be said for the upper-quadrant signal. It would be interesting to know what would now be done with the upper-quadrant design through the British Standards Institution committee, on which he had sat up to the war.

French Internal Train Services

The work done by the S.N.C.F. (French National Railways Company) in restoring international train services was reviewed in our April 12 issue. At the same time much has been done towards restoring internal main-line and cross-country services on a scale that can be considered liberal in view of the problems with which the administration has had to contend in the way of war damage and motive power and rolling stock shortages. The services now reviewed are those in operation at the present moment, and which will again be amplified in the summer timetables coming into force on Monday next, May 6.

In the Eastern Region, two railcar services run without stop from Paris to Nancy in 4 hr. 7 min. and reach Strasbourg in 6¼ to 6½ hr.; they are first and second class, with a supplement of fr. 70 to Nancy and fr. 100 to Strasbourg, and, as on all similar services in France today, reservation of seats in advance is obligatory.

There is one three-class "express" between Paris and Strasbourg in a little over 10 hr., and one between Paris and Nancy in about 6½ hr., both with restaurant facilities; at night the "Orient Express" reaches Strasbourg in 9 hr. with Chalons-sur-Marne and Nancy stops. There is a three-class night "express" taking only 1½ hr. longer.

On the Reims—Mezières-Charleville main line the two principal services from Paris run only as far as Mezières-Charleville and Sedan, where they connect with through trains from Lille to Metz, and Calais to Thionville; and there is one fast railcar between Reims and Paris. For the Belfort line the departures are still from the Gare de Lyon *via* Montereau, to join the Est main line at Flamboin. The express service consists of one day train at 8.25 a.m. to Mulhouse in 11 hr. 19 min.; and at night the "Arlberg Express" at 7.30 p.m. to Basle in 11 hr., and a three-class train at 9 p.m. Through trains on the Dijon—Metz, Lille—Dijon, and Lyons—Strasbourg services touch this route.

The Northern Region gives two three-class services between Paris and Calais, as well as a second-class railcar, taking 4 hr. 22 min. from Paris with seven stops, and the "Golden Arrow" Pullman at 11.35 a.m. to Calais Maritime in 3 hr. 55 min., returning at 2.47 p.m. in 3 hr. 58 min. Between Paris and Lille there are two fast railcars in 3 hr. with two stops (first and second class with a fr. 60 supplement for the whole journey), as well as four day fast trains and one night "express," all but one running into Amiens. The St. Quentin Line has a railcar between Paris and Brussels Midi, with no advertised stop, in 4 hr. 18 min. (first and second class, and apparently without supplement) as well as one day and one night "express."

The day train, 12.30 p.m. from Paris and 9.15 a.m. from Brussels, takes a little over 6 hr. with a frontier stop of 1 hr. at Feignies. There is a second class railcar between Paris and Jeumont, running to Aulnoye *via* Soissons, Laon and Hirson; and one morning "express" from Paris to Liége at 8.30 a.m. and one in the evening to Jeumont at 4.55 p.m.

The Western Region service between Paris and Le Havre now consists of one railcar (first and second, with a fr. 50 supplement) at 7.5 a.m. in 3 hr. 17 min. returning in the evening at 5.30 p.m. in 3 hr. 11 min.; two expresses at 8.30 a.m. and 5.5 p.m. from Paris and three at 8.15 a.m., 1.25 p.m. and 5.50 p.m. from Le Havre; one express and one non-stop railcar (first and second, and a supplement of fr. 30) between Paris and Rouen; and a morning "express" from Rouen to Havre. Some of these trains give Dieppe connections *via* Rouen, and on the direct Paris—Dieppe line there is only one fast service (6.20 a.m. from Dieppe and 5.7 p.m. from Paris), as the Newhaven boat

train is not advertised owing to its varying departure times. Cherbourg gets one day and one night "express" from Paris at 8.40 a.m. and 11 p.m., but two day services back, at 8.10 a.m. and 2 p.m.

There is one day and one night service between Paris-Montparnasse and Brest (the fastest takes 11¼ hr.) supplemented by one "express" between Rennes and Paris and two between Le Mans and Paris, which convey the Quimper and Nantes traffic. The old Etat route to Bordeaux carries no fast trains at all between Chartres, Saumur, and Saintes, and there is one through "express" between Nantes, La Rochelle, Saintes and Bordeaux, still routed from St. Mariens-St.-Yzan into Bordeaux *via* Libourne.

Over the old Paris—Orleans route to Bordeaux (South-Western Region) there are two day *rapides* in 7¾ and 7¼ hr. from the Austerlitz station; the former, at 8.40 a.m., calls at St. Pierre des Corps, Poitiers, and Angouleme; and conveys all three classes, and the latter, at 4.25 p.m., is first and second class with a throughout supplement of fr. 120, and calls at the two last-named only—a non-stop run being advertised between Paris and Poitiers. These trains return from Bordeaux at 7.35 a.m. and 2.15 p.m. There is also a day "express" at 7.40 a.m. from Paris and 9.35 a.m. from Bordeaux, routed *via* Tours; two night services (also going into Tours); and two "expresses" between Paris and Tours. There is one day train between Paris and Toulouse *via* Limoges, and two night trains (one routed below Limoges *via* Capdenac); and the Bordeaux—Toulouse—Sète line still retains the Bordeaux—Marseilles through trains. The 8.40 a.m. from Paris to Bordeaux and 2.15 p.m. return train run through to the Spanish frontier, and have through carriages between Paris and Tarbes *via* Dax and Pau.

The South-Eastern Region (the old P.L.M.) offers a day three-class *rapide* to Marseilles at 8.15 a.m. in 14 hr. 3 min. with only nine stops, and a similar up train from Marseilles at 7.40 a.m. in 14¼ hr; there is also a two-class *rapide* at 5 p.m. to Lyons in 6 hr. 35 min. with only one advertised stop, at Dijon, and a supplement of fr. 100 for the through journey, returning from Lyons at 7.25 a.m.; a night *rapide* to the Riviera at 9.20 p.m. from Paris, and a slower night train to Lyons at 9.30 p.m.; and a midday "express" leaving Paris at 1.20 p.m. which finally reaches Nice at noon next day.

Two fast railcar trips are given from Marseilles to Nice at 6.35 a.m. and 8 p.m. (second class cars), returning from Nice at 8.35 a.m. and 5.10 p.m.; and a railcar runs three days a week between Grenoble and Marseilles through Veynes, which still gives a service in the day from Lyons to Nice *via* Digue and the Chemin de fer de la Provence, where a railcar runs between Digue and Nice in 3½ hr. Resturant car and buffet bar facilities are liberal and there are second class sleeping cars on all the principal night trains (first class sleepers are now limited to a few international services). No Pullman cars are advertised except on the "Golden Arrow."

LONGER PLATFORMS AT LEAMINGTON.—The platforms at Leamington Station, G.W.R., are to be lengthened to accommodate longer trains. At present, some trains have to pull up twice. This has an adverse effect on timekeeping and working of passenger and freight trains generally over this section of the line.

Research and Production Costs

In a paper dealing with research and production costs at the Federation of British Industries' Conference on March 27, Mr. A. Healey, B.Sc., F.I.R.I., Director of Production, Dunlop Rubber Co. Ltd., said: Not only each industry, but every unit in an industry, has its own special problems. Local variations in cost and quality of services such as water, gas and electricity, character of labour available, etc., give scope for special study if the best is to be achieved.

The managements of manufacturing units have their own ideas, they have a certain confidence in themselves, even a sense of superiority over others, and this, of course, is to be encouraged as being fruitful of improvement. Side by side with this spirit there must be an up-to-date knowledge, and a readiness to apply it, from whatever source it comes. The more individual a manufacturer is, the more he must find out for himself.

This observation brings us to a consideration of the minimum size of a unit which can support research. To many minds the large research laboratories and staffs of the great corporations suggests automatically that research is not for the smaller unit. How can they compete? They do compete, however, and there is a good reason for their relative success. To understand this, it is necessary to distinguish between the research directed to fundamental questions and that of the immediate application of knowledge to current procedure.

DECENTRALISING OPERATIONS

The research worker in a smaller unit, which might pay his salary without embarrassment, in collaboration with an active and broadminded manager, can excel in application of science. No one realises better than the managements of the great corporations the value of this application and often they decentralise their operations to take better advantage of it.

Perhaps enough has been said to indicate that contribution to a research association is not in itself enough. An association is of great value in connection with the more general problems of an industry, and in this field many Associations have done immensely valuable work, but there must always remain the individual problem, and it must be tackled individually. The presence of scientific workers, first engaged on known problems, will soon bring to light other problems and other possibilities, not hitherto known to exist.

In industry, the old hands, apt to pride themselves on having no scientific education or knowledge—a mistaken notion, for they have a great deal—have learned much from trial and error, and rule of thumb, and are skilled in their art. The young research worker may be over-confident, but if he is honest he will soon come to admire the old hand, while simultaneously finding the problems of industry are not so easy as he expected.

It was the practice in the rubber industry, before the days of instrumentation in the industry, but not before the days of science, for experienced foremen to determine the quality of their products by biting them and by pressing on them with some blunt instrument, such as a pencil. After a period of some 20 years of close study, and particularly of the development of new testing methods, it was still the case that by biting and pressing with a pencil, a very accurate gauge of quality was made. The real difficulties, however, with this kind of test, are that opinions vary as between different biters and pressers, and their knowledge can with difficulty be transmitted to the large number of inspectors and testers, and that biters may lose their teeth!

There must obviously be a frank exchange of experience and the problem must be fully stated. As we are concentrating on production costs it is pertinent to remark that the research worker who is expected to get results must know all the elements of costs as they exist. In different industries the costs differ in their make-up. Two examples are given:—

	A	B
Material used	70	10
,, unavoidably wasted ...	5	—
,, otherwise wasted ...	2	1
Labour	8	40
Supervision and inspection ...	2	20
Services (water, gas, etc.) ...	2	10
Technical services	2	3
Management	5	10
Fixed expense	4	6
	100	100

With figures like these before him, combined with a scientific appreciation of the products and processes, the research worker can determine his most useful target. In "A" he would probably give the greatest attention to the material used and wasted, while in "B" he would consider the processes and the tolerances. By close collaboration between manager and research worker, the most hopeful line of attack is followed up, and all necessary facilities are given. The management, too, must have faith and patience. How often have initial failures been seized upon by management as an excuse for stopping the research!

A paper on production costs would not be complete without some remarks on the cost of research, which must eventually appear in total product cost. Much has been written on this, and some authors have given tables and charts as a guide to the expenditure in research which should be undertaken by firms of varying size. While these tables are of interest, they are unlikely to influence the unbelievers.

Another method of approach, still a general one, consists in a study of the whole cost, and the possibilities of saving. A factory consuming annually £100,000 worth of materials might usually expect to save 2 per cent. or £2,000 annually at the least by the application of the latest scientific knowledge and method. This saving would justify the employment of a research worker or two. Labour and inspecting costs could be similarly studied. It is a narrow view, but it is almost certain to lead to a broad one, if followed up.

G. D. PETERS & CO. LTD.—A statement by Lord Inverforth, Chairman, issued with the report and accounts of the company for 1945, explains that the trading profit for the year was lower on account of cancellation of Government contracts. The available balance of £72,590, after making provision for E.P.T., was, however, higher than in 1944, and after a total distribution of 17½ per cent. for the year, the carry-forward of £38,735 compared with £38,434 brought in. The company's vacuum brake department was now fully occupied, but in other directions the continuance of Government controls and the difficulties of obtaining material and suitable labour hampered the company's ability to obtain and carry out orders.

Long-Distance Coach Services

During the past few weeks many of the railway-associated provincial bus companies have been able to resume long-distance coach service workings, at any rate in skeleton form. The first was the service between London and Blackpool (operated by Standerwick, a subsidiary of Ribble Motor Services Limited) already recorded in these columns. Others have been as follow:—

East Kent Road Car Co. Ltd.—From February 22. London—Charing—Canterbury — Margate — Ramsgate; London — Charing—Canterbury—Deal; London—Ashford—Folkestone—Dover.

Eastern Counties Omnibus Co. Ltd.—From March 1. London—Ipswich—Southwold; London — Cambridge — Norwich; London—Bury—Lowestoft—Yarmouth.

Eastern National Omnibus Co. Ltd.—From March 4. London—Braintree—Halstead. From April 18. London—Colchester—Clacton.

Southdown Motor Services Limited.—From March 22. London—Uckfield—Eastbourne; London—Brighton; London—Horsham—Worthing; London—Midhurst—Chichester—Bognor; London—Petworth — Littlehampton — Bognor; London — Hindhead—Petersfield—Portsmouth: London—Alton—Gosport.

Crosville Motor Services Limited.—From April 1. London—Oxford—Warwick — Birmingham—Chester—Liverpool (day and night services).

Western S.M.T. Co. Ltd.—From April 8. London — Grantham — Doncaster — Carlisle—Glasgow.

Royal Blue Express Services. From April 15. London — Bournemouth: Bournemouth—Exeter—Plymouth; London — Salisbury — Yeovil — Exeter—Plymouth; Bournemouth—Portsmouth; Portsmouth—Yeovil—Ilfracombe. The timings are arranged to permit of London—Salisbury—Yeovil—Ilfracombe bookings.

Staff & Labour Matters

Railwaymen's Brave Conduct

The following have been notified in *The London Gazette* (Third Supplement) as having received King's Commendations for Brave Conduct, for services when fires occurred among wagons loaded with explosives:—

Mr. Thomas Clarke, Yard Foreman, Cardiff, Bute Docks, Great Western Railway.

Mr. Reginald Curry, class 1 shunter, Cardiff, Bute Docks, Great Western Railway.

Mr. Phillip Hughes, class 3 shunter, Cardiff, Bute Docks, Great Western Railway.

Mr. Edgar Samuel Molineux, class 3 shunter, Cardiff, Bute Docks, Great Western Railway.

Mr. Albert John Stephenson, Yard Traffic Inspector, Cardiff, Bute Docks, Great Western Railway.

Road Passenger Transport Wages

The main recommendations contained in the report of the court of inquiry covering wages and conditions of employment of workers in company-owned bus undertakings within the National Council for the Omnibus Industry were:—

(1) *Grouping*:—It is recommended that, for wages purposes, the companies should be divided into two groups, the line between groups 1 and 2 to be drawn at the point where the existing driver's wage is 90s. 6d. a week. This division should place 23 companies in group 1 and 37 companies in group 2. The report recommends that provision should be made for the National Council to consider appeals against grouping.

The following rates are recommended for drivers' and conductors' wages:—

Group 1			A week
Drivers	...	...	96s. to 100s.
Conductors	...	...	92s. to 96s.
Group 2			A week
Drivers	...	...	94s. to 98s.
Conductors	...	...	90s. to 94s.

These figures represent increases on present rates varying from 7s. a week to over £1 a week.

(2) *Assimilation*: It is recommended that drivers and conductors should receive an immediate increase of 7s. 6d. a week. In so far as this increase does not bring them to the maximum of their new scale, the difference should be divided by four, one fourth to be granted immediately and another fourth at the end of each of the next three years.

(3) *Garage Staff*: Increases to the levels recently agreed in respect of municipal employees of similar grades are recommended with a similar method of assimilation to that for drivers and conductors.

(4) *Skilled Maintenance Engineers*: An increase to 105s. a week is recommended.

(5) *Women*: In so far as women are employed by companies purely as a war-time measure, no recommendation is made. Where, however, the employment of women is a normal feature of the company's practice in ordinary times, increases are recommended to preserve the existing differentials with men.

(6) *Conditions*: The existing arrangement, whereby the agreed "model conditions" may on application be substituted as a whole for an existing conditions agreement, should continue. Where "model conditions" have not yet been applied this should be done without delay.

(7) *Stabilisation*: In pointing out that the substantial increases suggested would cost the companies about £3½ million the court emphasises strongly that, in the absence of changes of circumstance affecting the whole bus industry, the new wage rates should hold for a number of years.

(8) *Consolidation*: The court does not feel that there should be any consolidation of basic rates and war and other advances for this section of the industry.

Parliamentary Notes

Railways (Valuation for Rating) Bill

Mr. Aneurin Bevan (Minister of Health) on April 16 presented to the House of Commons the Railways (Valuation for Rating) Bill, the object of which is to amend the Railways (Valuation for Rating) Act, 1950. It was formally read the first time.

Great Western Railway Bill

The Great Western Railway Bill was read the first time in the House of Lords on April 15, and referred to the examiners.

Questions in Parliament

Restaurant Car Charges

Mr. John Lewis (West Ham, Upton—Lab.) on April 8 asked the Minister of Transport if he was aware that, to passengers on main-line trains, the cost of luncheon with a cup of coffee, and the service charge which was added to bills supposedly in lieu of gratuities, amounted to 4s. 4d.; and, as, apart from considerations of the quality of food provided, that sum was too high for the average third class passenger to pay, he would take steps to have those charges reduced.

Mr. Alfred Barnes (Minister of Transport) in a written answer stated: The standard charge of 3s. 6d. is the same as before the war. A charge of 4d. is made for coffee and a service charge of 6d. is made by agreement with, and for the benefit of, the staff concerned, and I believe is generally welcomed by the travelling public.

Aberdeen-London Railway Service

Major S. Ramsay (Forfar—C.) on April 4 asked the Minister of Transport whether it would be possible to run later trains from Aberdeen to London during the summer months, both L.N.E.R. and L.M.S.; and would he also arrange for the running of sleeping cars on the latter railway.

Mr. Alfred Barnes stated in a written answer: On account of their difficulties as regards staff and rolling stock, I am afraid the companies will not be able to effect these improvements in the near future. The question will, however, be borne in mind as conditions improve.

Electrification of Suburban Railway Services

Mr. A. Edward Davies (Burslem—Lab.) on April 9 asked the Minister of Transport what progress had been made in the electrification of suburban railway services as recommended in the Final Report of the Royal Commission on Transport, 1930.

Mr. Alfred Barnes in a written answer stated: Since the date of the report the mileage of lines electrified has been as follows: Main-line railway, 480¼ route miles; London Passenger Transport Board, 24 miles.

In addition, electrification of the following route mileages was in hand, but was interrupted by the outbreak of war: main-line railways, 125¼ route miles; London Passenger Transport Board, 62¾ route miles.

It is difficult to draw the line precisely between suburban and other lines, but, on a broad interpretation, all the above mileage may be regarded as of an urban or suburban character.

Train Service to and from Hull

Commander H. Pursey (Kingston-upon-Hull East—Lab.) on April 15 asked the Minister of Transport whether he was considering improving the train services to and from Hull by providing more trains with through coaches and reducing the time taken and, in particular, improving the Sunday services so that large numbers of passengers did not have to stand for the journey to Doncaster and on joining main-line trains which were full.

Lt.-Commander Gurney Braithwaite (Holderness—C.) also asked the Minister of Transport when the through train service from Kings Cross to Hull, and *vice versa*, would be improved.

Mr. Alfred Barnes: Since October, 1945, there have been three through trains in each direction on weekdays between London and Hull and in addition five services from London and four from Hull involving a change at Doncaster. As from Monday, May 6, one additional service will be provided in each direction, involving a change *en route*. Further improvements of weekday and Sunday services will be made when the resources of the railway company permit.

Journey times on this route were accelerated by up to 56 minutes in October, 1945. Further accelerations must depend

on rehabilitation of the track and locomotives.

Commander Pursey: Will the Minister have a thorough investigation made into the services to and from Hull, and ask the railway companies whether they will consider putting on extra coaches at Doncaster, where they have plenty, to avoid the overcrowding which takes place there?

Mr. Barnes: Not long ago the services between London and Doncaster were improved.

Lt.-Commander Gurney Braithwaite: Will the Minister bear in mind that there is all the difference in the world between a through coach and a through train? Accommodation between London and Hull is hopelessly inadequate, and it is quite common for both first class and third class passengers to have to stand all the way between London and Hull.

There was no reply.

London—Scotland Night Expresses

Mr. R. J. G. Boothby (East Aberdeenshire—C.) on March 18 asked the Minister of Transport whether he would represent to the railway companies that, in the interests of the business community, the night expresses between London and Scotland should now revert to their pre-war timing; and, in particular, that the time of departure at each end should be postponed by not less than one hour.

Mr. Alfred Barnes: Services cannot yet be restored to their pre-war level, but I am glad to say that the summer timetables (to be introduced on May 6) will provide some improvements.

Mr. Boothby: Can the Minister say what advantages are derived from starting people off at 9.30 and putting them out at 6.30, when they can be started at 10.30 and be put out at 7.30?

Mr. W. Gallacher (West Fife—Communist): Is the Minister further aware that the strictures of the Leader of the House and of the Scottish Members would be removed if the times were altered?

Mr. Barnes: This question of meeting the convenience of different Members is not easy to effect, but I am prepared to listen to representations on these matters.

L.P.T.B. Retirement Age

Lt.-Colonel M. Lipton (Brixton—Lab.) on April 8 asked the Minister of Transport what was the compulsory retirement age by persons employed by the L.P.T.B.; which directors of the Board were over that age; and whether the same age of retirement would apply to directors as to employees.

Mr. Alfred Barnes: The general use of compulsory retirement for officers and servants of the London Passenger Transport Board is 65 for men and 60 for women. Since the outbreak of war the rule as to compulsory retirement has been in abeyance. Under the statute, Members of the Board are appointed for terms of not less than three or more than seven years, and no question of age limit arises.

Colonel Lipton: Does not the Minister think it would be desirable to have the same age limit applicable to all persons in the pay of the L.P.T.B.?

Mr. Barnes: At this moment I am governed by the statute, and I see no advantage in expressing a personal opinion.

L.P.T.B. and Lost Identity Cards

Sir Gifford Fox (Henley—C.) on March 21 asked the Minister of Health (1) whether, in view of the relaxation of security control, a change could be made in the practice whereby the L.P.T.B. was obliged to return lost identity cards to the National Registration authority rather than return them direct to the owners, when the identity was easily ascertained; and what representations he had received from the L.P.T.B. on those matters; and (2) what revenue was obtained through charging 1s. for the replacement of lost identity cards; whether he was aware that considerable annoyance was caused to the public through the practice of extracting identity cards, ration and clothing books from any receptacles handed in to the Lost Property Office, for however short a time; and if the practice of charging 1s. for renewing identity cards, in those cases at least would be discontinued.

Mr. Aneurin Bevan (Minister of Health): I have received no representations in this matter from the London Passenger Transport Board. I am, however, in sympathy with the object Sir Gifford Fox has in view and I am in touch with the Minister of Transport on the subject. I hope that it will prove possible to effect some modification of the existing procedure. In the year ended March 31, 1945, £29,401 was received for cards replaced.

Jamaica Railway Strike

Mr. Thomas Reid (Swindon—Lab.) on March 20 asked the Secretary of State for the Colonies if he was now able to make a statement about the strikes in the mental hospital, railways, fire service, printing office, and part of the Public Works Department, Jamaica.

Mr. A. Creech Jones (Under-Secretary of State for the Colonies): The Government Printing Office employees returned to work on February 25. The strikes in other essential services ended by agreement with the Trades Union Council on March 11. As I informed the House on March 13, this enables any outstanding matters affecting the workers to be settled by negotiation.

Mr. Reid: Is it not a fact that at the back of these strikes is the rivalry between the T.U.C. union and Mr. Bustamente's union, and may I ask him if Mr. Bustamente's personal union is liable for registration under the laws of the colony.

Mr. Creech Jones: The latter part of the question should obviously be addressed to the Governor of Jamaica, and I am unable to answer it. Undoubtedly, a great deal of the trouble has arisen from internal union rivalry.

Railway Wages in Northern Rhodesia

Mr. A. G. Bottomley (Chatham—Lab.) on March 27 asked the Secretary of State for the Colonies what action had been taken in Northern Rhodesia to implement the recommendations made by a commission of inquiry into the grievances which had given rise to the strike among African railway employees last November; and whether the basic wage for Africans had now been increased to 25s. a month, with rations and housing.

Mr. George Hall (Secretary of State for the Colonies) in a written answer stated: The commission's recommendations have, I understand, been generally accepted by the railway company. The answer to the second part of the question is "Yes, Sir." As stated in my reply to Colonel F. J. Erroll (Altrincham—C.) on February 6, the recommendations for increases in wages have been implemented.

European Central Inland Transport Organisation

Flight-Lieutenant J. E. Haire (Wycombe—Lab.) on March 25 asked the Minister of Transport what were the policy and functions of the European Control Organisation for International Transport; what nations were co-operating, and which had refused.

Mr. Alfred Barnes in a written answer stated: The purposes and functions of the European Central Inland Transport Organisation are set out in Command Paper 6685 of 1945, of which I am sending Flight-Lieutenant Haire a copy. The agreement was signed on behalf of the Governments of the following countries: United States of America; Belgium; Czechoslovakia; France; United Kingdom; Greece; Luxembourg; Netherlands; Norway; Poland; Union of Soviet Socialist Republics; Jugoslavia.

Tube Tunnel Inspection Trolley

A pedal-propelled track trolley with carbide lighting used by London Transport for inspecting the permanent way in tube tunnels after traffic hours

Notes and News

Victory Day Bonus for Skefko Employees.—The Skefko Ball Bearing Co. Ltd., of Luton, is to distribute a £10,000 Victory Day bonus to 3,500 employees and a number of former employees.

East Kent Road Car Co. Ltd.: Registered Office.—The registered office of the East Kent Road Car Co. Ltd. has been removed from Robin Hood, Charing, to Odsal House, London Road, Canterbury.

Cost-of-Living Index.—At April 1 the official cost-of-living index figure was 103 points above the level of July, 1914, showing no change as compared with a month earlier. At April 1, 1939, it was 53 points above July, 1914.

Locomotive Running Foremen Required.—Two locomotive running foremen, age 30-35 years, are required by the Sudan Railways. Candidates should be of good general education, have served a full apprenticeship as a fitter in a railway locomotive works, and have had some running shop experience. For full details see Official Notices on page 499.

L.M.S.R. Whitehaven-Sellafield Service Restored.—The L.M.S.R. will restore on May 6 the passenger service between Whitehaven and Sellafield, *via* Egremont, which has been suspended since January, 1935. On and after this date the intermediate stations of Moor Row, Woodend, Egremont, and Beckermet will again deal with passenger train traffics.

Permanent Way Institution.—By the courtesy of Mr. H. Maxwell Rostron, General Manager & Engineer of the Liverpool Overhead Railway, members of the Manchester & Liverpool Section of the Permanent Way Institution have been invited to visit that railway on May 4. Members should assemble below Pier Head Station at any time from 2.30 to 3.10 p.m., whence parties will proceed every 10 minutes to Dingle and Seaforth. Arrangements are being made for inspection, during the course of the round trip, of the cabin at Dingle and the carriage works and running shed at Seaforth Sands.

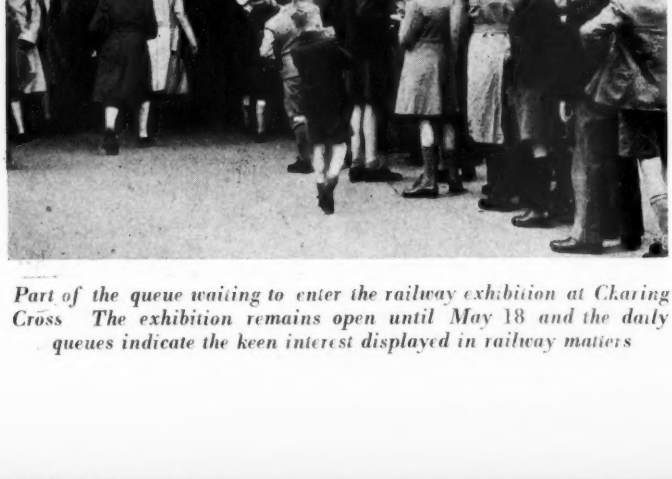
Agreed Charges.—Applications for the approval of 63 further agreed charges under the provisions of section 37 of the Road & Rail Traffic Act, 1933, have been lodged with the Railway Rates Tribunal. Notices of objection must be filed on or before May 14 next.

Visit of Minister of Transport to Southampton.—We are informed that the caption supplied to us by the Southern Railway for the illustration on page 469 of our last week's issue, in connection with the visit of the Minister of Transport to Southampton Docks, contained an inaccuracy. The lady second from the left in the illustration should have been described as Mrs. Alfred Barnes (not as Mrs. Gore Browne).

The Lines of Communication, Assam.—In our issue of January 18 we published an article dealing with a lecture given by Sir George Cuffe, Director-General, Railways, Calcutta, in which he gave the story of surface transport immediately behind the Burma Front during the Japanese threat to India. Sir George Cuffe informs us that in some respects his talk was incorrectly reported. In the article, reference was made to the American train despatchers introducing the uniflow system of working. This system, in fact, was used only on the broad gauge, which remained under the control of the Bengal Assam Railway, and it was introduced by the Divisional Superintendent, Calcutta, Mr. B. W. Patterson, and his officers. It was also stated, with reference to the greatest number of wagons taken across the ferry at Amingaon, that 791 up and 784 down were handled in a single period of 24 hours; these figures were the daily average for the best month—February, 1945. Similarly, reference was made to the peak load of 8,975 tons in one period of 24 hours. This figure was the daily average for the best month—April, 1945. The load of two-thirds petrol and one-third beer was carried not by one of the first trains sent over the Lines of Communication, Assam, after the relief of Imphal, but to the first road convoy from Manipur Road to Imphal after the road was cleared.

Nameplates for L.N.E.R. Inquiry Office Staff.—An innovation in railway inquiry office practice, designed to facilitate personal contact between staff and public, was introduced on May 1 by the L.N.E.R. at Kings Cross. Each of the seventeen members of the counter staff in the in-

"News Chronicle" Centenary Railway Exhibition



Part of the queue waiting to enter the railway exhibition at Charing Cross The exhibition remains open until May 18 and the daily queues indicate the keen interest displayed in railway matters

British and Irish Railway Stocks and Shares

Stocks	Highest 1945	Lowest 1945	Prices Apr. 30 1946	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	60⅜	47½	56	+ ½
5% Con. Pref. ...	124½	104½	113	—
5% Red. Pref. (1950)	107⅜	101½	103	—
5% Rt. Charge ...	137½	120	126½	—
5% Cons. Guar. ...	135½	117	122½	—
4% Deb.	118	106	112	—
4½% Deb.	119½	108	112½	—
4½% Deb.	124½	111½	117	—
5% Deb.	138	124	127	—
2½% Deb.	83	74½	85½	—
L.M.S.R.				
Ord.	33	23½	28	+ ½
4% Pref. (1923) ...	65	50	57	— ½
4% Pref.	80⅜	69½	80	+ ½
5% Red. Pref. (1955)	106½	99½	101½	—
4% Guar.	106½	97	103½	—
4% Deb.	110½	102	108	+ ½
5% Red. Deb (1952)	110½	103½	105½	—
L.N.E.R.				
5% Pref. Ord. ...	8¼	5½	6	—
Def. Ord.	4½	2½	3	—
4% First Pref. ...	62½	49½	56	— ½
4% Second Pref. ...	33½	24½	27½	+ ½
5% Red. Pref. (1955)	103	96	98	+ 1
4% First Guar. ...	104½	95	102	+ 1
4% Second Guar. ...	97	89½	94	—
3% Deb.	91⅜	82⅛	94½	+ ½
4% Deb.	109⅜	101	108	+ ½
5% Red. Deb. (1947)	103⅛	100	100	—
4½% Sinking Fund Red. Deb. ...	106⅜	103	104½	+ 1
SOUTHERN				
Pref. Ord.	79½	63	76	+ ½
Def. Ord.	27	20¼	21½	—
5% Pref.	124½	104	112½	—
5% Red. Pref. (1964)	117	107	108½	—
5% Guar. Pref. ...	135⅜	117	122½	—
5% Red. Guar. Pref. (1957)	117	106½	108½	—
4% Deb.	117	104½	110	— ½
5% Deb.	137	124	126½	—
4% Red. Deb (1962-67)	112	104½	107½	+ 1
4% Red. Deb. (1970-80)	113½	104	108½	+ 1
FORTH BRIDGE				
4% Deb.	106	103	104	+ 1
4% Guar.	106	101	102	—
L.P.T.B.				
4½ "A"	125	117	123½	—
5% "A"	135	127	133½	—
3% Guar. (1967-72)	100	97½	104	+ ½
5% "B"	125½	115	118½	—
"C"	70	58	60	— 1
MERSEY				
Ord.	37	31¼	30½	— ½
3% Perp. Pref. ...	72½	68¼	72	—
4% Perp. Deb. ...	104½	104	103	—
3% Perp. Deb. ...	84	78½	81	—
IRELAND*				
BELFAST & C.D.				
Ord.	8½	6	7½	—
G. NORTHERN				
Ord.	34	24½	37½	—
Pref.	52½	42⅜	57	—
Guar.	80	68	84	—
Deb.	97½	87½	101½	+ ½
IRISH TRANSPORT				
Common	—	—	16 9	—
3% Deb.	—	—	101¼	—

* Latest available quotation

OFFICIAL NOTICES

Sudan Government

SUDAN Railways require two LOCOMOTIVE RUNNING FOREMEN, age 30-35 years, preferably unmarried. Candidates should be of good general education and should have served a full apprenticeship as a fitter in a Railway Locomotive Works, and have had some running shop experience. Carriage and wagon experience would be an added recommendation.

Scale of pay attached to the post is £E.252—276—300—324—360—396—432—480—540—600. (Biennial increases. £E.1 = £1 0s. 6d.) The starting rate in this scale will be determined according to age, experience and qualifications, and the four lowest rates would not necessarily apply to a well-qualified man of 30 years or over.

A Cost-of-living Allowance at the rate of 35 per cent. of pay, subject to a maximum of £E.15 per mensem, payable on all salaries up to £E.1,200 per annum. A progressively reduced allowance is payable to officials on higher salaries. At present there is NO INCOME TAX in the Sudan. Free passage and Outfit Allowance of £E.40 on appointment. Strict medical examination.

Appointment on Probationary Contract, with a view to pensionable service.

Applications, giving full particulars of age, qualifications and experience, should be sent to the Controller, Sudan Government London Office, Wellington House, Buckingham Gate, London, S.W.1. Envelopes should be marked "Loco. Foreman."

RAILWAYS AND LOCOMOTIVES. Books, Pamphlets, Maps and Prints. All wanted. Send on approval stating price.—Grafton & Co., 51, Great Russell Street, London, W.C.1.

LOCO. DRAUGHTSMEN required with knowledge of latest steam and diesel practice by West Midland firm. Reply, stating age, experience, qualifications and salary required, to Box No. 7, *The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1.

SECTIONED PERSPECTIVE VIEW OF LOCOMOTIVE FRONT END. A notable drawing of L.M.S.R. class "7P" 4-6-2 locomotive of the latest type. Reprinted from *The Railway Gazette*, June 15, 1945. *Price* 2*s.* 6*d. Post free* 2*s.* 8*d.*

quiry office on No. 10 platform has been provided with a neat plate, bearing his name, which will be displayed whilst he is on duty. If the experiment is popular with the public the idea will be extended to other large inquiry offices at L.N.E.R. stations. The practice will be particularly convenient in connection with sleeping berth reservations, when passengers have to make subsequent contact with the member of the staff with whom the booking was made.

G.W.R. Ellesmere Branch Re-opening.—The Great Western Railway branch line from Wrexham to Ellesmere is to be reopened for passenger traffic on May 6. It was closed in 1940 to accommodate the Royal Ordnance Factory at Marchwiel.

Dover Boat Train Refreshment Cars.—On May 1 the all-plastics Pullman buffet car, which was included in the formation of the "Golden Arrow" express on its demonstration run on April 13, was placed in regular service on that train. It has now been named "Trianon," and has taken the place on the "Golden Arrow" of the "Trianon" bar car illustrated in our April 19 issue. The latter vehicle is now running as a Pullman refreshment car in the Dover boat train which leaves Victoria ahead of the "Golden Arrow" at 9.20 a.m., and arrives in London on the return journey at 8.47 p.m.

Royal Train for South Africa.—The Metropolitan-Cammell Carriage & Wagon Co. Ltd., of Saltley, Birmingham, has been instructed by the South African Railways & Harbours Administration to build a new Royal Train to be used by the King and Queen and the two Princesses on the occasion of their visit to South Africa in February next year. The order involves the design and construction of twelve fully air-conditioned coaches, and special arrangements will have to be made in order that the coaches may be shipped from this country before the end of the present year. The construction of the coaches will follow broadly that of the "Blue Train" which was built by the Metropolitan-Cammell Carriage & Wagon Co. Ltd. in 1938 for service between Cape Town and Johannesburg, and described in our May 26, 1939, issue. The interiors of the new coaches, however, will be specially furnished for the purpose for which they are required.

"Books of Switzerland" Exhibition.—An exhibition of Swiss books and periodicals, sponsored by the British Council and the Swiss organisation, Pro-Helvetia, was opened at the Suffolk Galleries, Suffolk Street, London, S.W.1, on April 25. Miss Ellen Wilkinson, Minister of Education, in opening the exhibition, said that it marked the re-opening of cultural relations with Switzerland after a break of six years, and spoke of the need for a much larger circulation of books between all countries if the nations were to know each other better. An historical section, emphasising the important work of Swiss publishers in producing original works and translations in early years, includes a commentary on the Bible published in 1470. Modern technical works in the exhibition include the house journals of several important Swiss engineering firms. A treatise on railway rates by Dr. M. Paschond, of the Federal Railways Administration, is shown in the economic section. The exhibition will be open until May 25.

Disposal of Government-Owned Surplus Machine Tools.—The Ministry of Supply is to open a machine tool regional disposal centre on May 6 at G.E.C. Building, Kingsway, Cardiff. These offices will be run in conformity with the arrangements already in operation at other large towns and would-be purchasers will be able to consult up-to-date records of all Government-owned surplus machine tools available for sale in the many stores throughout Great Britain. Permits for inspection of machine tools lying at these stores can be obtained and facilities for making offers to purchase will be provided.

Railway Supplies for Overseas.—A contract for the manufacture and supply of a special type of tipping gear for hopper wagons used on the Indian State Railways has been placed with Air Dispatch Limited, the Airport, Cardiff, an aircraft and general engineering company. The contract is the first of its kind placed by the Indian Government with a South Wales concern. The company has also received an order through the Colonial Office for the manufacture of spare parts and other accessories required for locomotives and rolling stock in use on the Federated Malay States Railways. This is a long-term contract which is to be spread over nearly ten years. Air Dispatch Limited, originally an internal and Continental air service operator, entered the engineering field at the beginning of the war.

Improved G.W.R. Local Station Services.—London suburban and outer suburban stations will be given improved long-distance connections in the timetables which come into operation on May 6. A new train on weekdays at 7.16 a.m. from Ealing Broadway and 7.35 a.m. from Slough will run to Reading, Didcot, Oxford, Banbury, Leamington, Birmingham, and Wolverhampton. Ealing Broadway will also have a through service at 8.20 a.m. to Reading, Oxford, Banbury, Leamington, and Birmingham, giving a connection at Oxford with a new diesel-railcar service to Worcester and Hereford. On Saturdays there will be a service from Ealing Broadway at 7.22 a.m., Slough at 7.43 a.m., Maidenhead at 7.55 a.m., and Twyford at 8.10 a.m. to Reading, Frome, Taunton, and principal stations to Penzance. In addition to the Oxford—Hereford diesel service already mentioned, there will be a new diesel trip from Maidenhead at 7.55 a.m. (from Reading at 8.26 a.m. on Saturdays) to Newbury.

Withdrawal of Army Post Office Mail Train.—After running 160,000 miles since D-Day, the L.N.E.R. Army Post Office Mail made its last trip from Nottingham to Folkestone on April 15. Since its introduction on April 25, 1944, the train has carried over 3,000,000 bags of mail and parcels to the British Liberation Armies and the British Army of the Rhine. At first the train ran to Southampton, serving the Forces personnel standing by for the invasion of Europe. On October 16, 1944, it was diverted to Tilbury, and on November 7 to Dover. The train ran to Dover until June 16, 1945, and on the next day was diverted to Folkestone, to which port it ran until its withdrawal. An illustration and a brief account of the train appeared in our February 2, 1945, issue.

Courses for Railway Boiler Operatives.—Succeeding courses organised in London for L.M.S.R. personnel employed in the operation of central heating appliances, arrangements are now complete for similar training to be given at other centres. Instruction is being given at Leeds, during the fortnight which commenced April 29, and will be given at Birmingham, where staff from the G.W.R. will join in, from May 5 to 17. A two-weeks' course for L.M.S.R. operatives is to be held in Glasgow from May 20, and one starting on June 3 will be held in Edinburgh for employees of the L.N.E.R. Engineers and stoker demonstrators of the Ministry of Fuel & Power will give the lectures and practical demonstrations.

Contracts and Tenders

Below is a list of orders placed recently by the Egyptian State Railways:—

Clyde Crane & Engineering Co.: Spares, power house gabbary.

Alton Battery Co. Ltd.: Glass support sheets.

R. L. Ross & Co. Ltd.: Ross safety valve.

British Tabulating Machine Co. Ltd.: Cards for hollerith machine.

Cincinnati Milling Machines Limited: Horizontal plane milling machine single spindle.

Hall Harding Limited: Tracing paper.

James Chesterman & Co. Ltd.: Drawing office material.

North British Locomotive Co. Ltd.: Locomotive spares.

Gresham & Craven Limited: Locomotive spares.

Stewarts and Lloyds Limited: Sockets.

General Electric Co. Ltd.: Elbows, junction boxes, fuse carriers, etc.

Power Flexible Tubing Co. Ltd.: Tubing.

Bullers Limited: Insulators.

Imperial Chemical Industries Limited: Conductor.

John Oakey & Son Ltd.: Abrasives.

Railway Stock Market

Although still very active, stock markets lost part of their recent pronounced strength, reflecting a more cautious attitude and a disposition to await international developments. Suggestions that U.S. approval of the loan to Britain may be delayed also affected sentiment. British Funds, although again higher on balance, failed to hold best prices, and 2½ per cent. Consols lost part of an earlier further rise. Iron and steels remained under the nationalisation cloud and were generally lower; but buyers were in evidence on the assumption that in some instances declines had been overdone, and recovery from lowest levels recently recorded were shown by Stewarts and Lloyds, Guest Keen, United Steel, and Thomas & Baldwins. Cable & Wireless ordinary and preference stocks were higher on balance on the view that the nationalisation proposals appear to give a basis to assure fair compensation; but best prices were not held; it was pointed out that "net maintainable revenue" has yet to be clearly defined.

Home rails, after losing ground, developed a distinctly better tendency, earlier declines in junior stocks were partly regained, and preference stocks also improved. Buying was based on the extremely large yields shown at current levels and also on reasonable prospects of dividends being maintained around last year's levels so long as the fixed rental agreement remained in force, although in some cases this would entail further withdrawals from contingency reserves. The main factor attracting buyers, however, was a more general recognition that nationalisation compensation terms would be on a fair basis and probably would justify prices of junior stocks (and also preference stocks quoted under par) well above current levels. Opinions vary as to the method by which nationalisation would be effected; and it is realised that the terms in respect of the Bank of England, the coal industry, and Cable & Wireless, which differ materially in many respects, cannot be taken as a guide. Nor can it be assumed that the reference in the Cable & Wireless Bill to "net maintainable revenue" gives ground for hopes that in respect of the railways, compensation may hinge on "standard revenue" as defined in the Railways Act of 1921. Interesting calculations of prices that would be justified for railway stocks on differing compensation bases are attracting considerable attention in the market, although they have to be regarded mainly as theoretical, because compensation terms could be on one of a large variety of bases. Nevertheless, at long last there seems to be growing recognition that in the event of nationalisation there would be every reason to expect fair treatment, and that there may therefore be scope for a good rise in prices from current levels, bearing in mind that the latter appear to make little allowance for the compensation factor. The prevailing view is that whereas home railway stocks are unlikely to decline to any extent, there is a possibility of good appreciation in prices in due course.

Reflecting the better tendency in home rails, Great Western after receding to 54¾ at the end of last week, rallied to 55¼. Great Western 5 per cent. preference was maintained at 113, and the guaranteed stock moved fractionally higher at 123½, and the 4 per cent. debentures were unchanged at 112½. L.M.S.R. after falling back to 26½ at the end of last week, rallied to 27½; the senior preference improved to 80, the 1923 preference strengthened to 56½ after declining to 55; the guaranteed stock rose further to 104. Among L.N.E.R. stocks, the second preference, after 26½, rallied well to 27¾, and the first preference was 55½, after 55. L.N.E.R. guaranteed stocks, which as mentioned previously in these notes seem relatively undervalued in comparison with stocks of a similar status, were in better request; the firsts further improved to 101½ and the seconds to 94½. Southern deferred receded at the end of last week to 21¼, but later strengthened to 21½, and the preferred was 75½, after 75; the 5 per cent. preference at 112½ fully regained an earlier fractional decline. London Transport "C" failed to participate in the better tendency earlier this week, changing hands around 59.

Argentine rails encountered profit-taking and were lower on balance, despite a later rally. Buenos Ayres Great Southern at 10 was a point down, the 5 per cent. preference 24½, compared with 25½, and the 4 per cent. debenture 68, compared with 69, these stocks reflecting the general trend. Buenos Ayres Western 4 per cent. debentures at 62 were, however, unchanged on balance. Canadian Pacifics eased to 23⅞.

CRAVEN BROS. (MANCHESTER) LIMITED.—A final dividend of 15 per cent. has been declared, making 20 per cent. for 1945. Net profit was £73,041, against £70,366 in 1944.

Traffic Table and Stock Prices of Overseas and Foreign Railways

	Railways	Miles open	Week ended	Traffic for week: Total this year	Traffic for week: Inc. or dec. compared with 1944 5	No. of Week	Aggregate traffics to date: Totals 1945/6	Aggregate traffics to date: Totals 1944 5	Aggregate traffics to date: Increase or decrease	Shares or Stock	Prices: Highest 1945	Prices: Lowest 1945	Prices: Apr. 30 1946
				£	£		£	£	£				
South & Central America	Antofagasta	834	21.4.46	27,900	— 1,060	42	524,780	484,120	+ 40.660	Ord. Stk.	12	8½	9
	Arg. N.E.	753	20.4.46	ps. 314,000	+ ps. 51,700	42	ps. 12,418,900	ps. 12,511,800	— ps. 92,900	"	10	5½	5
	Bolivar	174	Mar., 1946	4,909	— 521	13	14,115	16,068	— 1,953	6 p.c. Deb.	8½	5½	6½
	Brazil	—	—	—	—	—	—	—	—	Bonds	25	17	28½
	B.A. Pacific	2,771	20.4.46	ps. 2,407,000	— ps. 33,000	42	ps. 95,900,000	ps. 98,944,000	+ ps. 3,956,000	Ord. Stk.	7	5	5½
	B.A.G.S.	5,080	20.4.46	ps. 3,842,000	+ ps. 274,000	42	ps 150,549 000	ps. 141,706,000	+ ps. 8,843,000	Ord. Stk.	13⅜	10¼	10¼
	B.A. Western	1,924	20.4.46	ps. 1,279,000	+ ps. 109,000	42	ps. 50,560,000	ps. 47,732,000	+ ps. 2,828,000	"	12½	9½	10
	Cent. Argentine	3,700	20.4.46	ps. 2,938,574	+ ps. 190,574	42	ps 132,497,679	ps. 121,782,200	+ ps. 10,715,479	"	9¼	7	6½
	Do.	—	—	—	—	—	—	—	—	Dfd.	5	2½	3½
	Cent. Uruguay	970	20.4.46	30,906	— 5,834	42	1,637,922	1,442,283	+ 195,639	Ord. Stk.	7½	4	7½
	Costa Rica	262	Mar., 1946	30,768	— 34	18	252,872	203,304	+ 49,568	Stk.	16½	13	12½
	Dorada	70	Mar., 1946	26,161	+ 2,061	13	85,975	82,705	+ 3,270	1 Mt. Deb.	103	102	101½
	Entre Rios	808	20.4.46	ps. 410,600	+ ps. 14,300	42	ps 17,854,200	ps. 16.675,600	+ ps. 1,178,600	Ord. Stk.	7½	4½	5½
	G.W. of Brazil	1,030	20.4.46	23,600	— 900	15	490,500	431,500	+ 59,000	Ord. Stk.	30/-	23/6	20/-
	Inter. Ctl. Amer.	794	Mar., 1946	$990,479	+ $192,442	13	$2,914,465	$2,280,411	+ $634,284	—	—	—	—
	La Guaira	22¾	Mar., 1946	4,421	— 972	12	16,850	15,910	+ 940	5 p.c. Deb.	78	70	61½
	Leopoldina	1,918	20.4.46	62,666	+ 17,915	16	907,483	717,453	+ 190,030	Ord. Stk.	4½	3½	3½
	Mexican	483	21.4.46	ps. 678,600	+ ps. 99,000	16	ps. 13,137,300	ps. 9,773,400	+ ps. 3,363,900	Ord. Stk.	¼	¼	1
	Midland Uruguay	319	Mar., 1946	15,555	— 2,295	37	163,841	156,831	+ 7,010	—	—	—	—
	Nitrate	382	15.4.46	8,568	+ 380	15	65,770	44,413	+ 21,357	Ord. Sh.	75 6	67/6	76/3
	N.W. of Uruguay	113	Mar., 1946	4,444	— 1,384	37	49,140	51,036	— 1,896	—	—	—	—
	Paraguay Cent.	274	19.4.46	£8,608	— £4,530	42	£2,531,803	£2,512,242	+ £19,561	Pr. Li. Stk.	79⅞	77	75½
	Peru Corp.	1,059	Mar., 1946	118,386	— 19,991	38	1,252,842	1,170,479	+ 82,363	Pref.	10⅜	7⅜	10⅛
	Salvador	100	Feb., 1946	c 233,000	+ c 27,000	32	c 1,080,000	c 957,000	+ c 123,000	—	—	—	—
	San Paulo	153⅓	—	—	—	—	—	—	—	Ord. Stk.	60½	50½	54
	Taltal	156	Mar., 1946	3,530	+ 205	40	28,020	23,370	+ 4,650	Ord. Sh.	17/-	10/6	16/3
	United of Havana	1,301	21.4.46	90,318	+ 21,960	42	2,396,302	2,298,078	+ 98,224	Ord. Stk.	3	1	2
	Uruguay Northern	73	Mar., 1946	1,477	— 361	37	15,691	14,295	+ 1,396	—	—	—	—
Canada	Canadian National	23,569	Mar., 1946	6,520,600	— 888,600	13	18,471,800	20,168,600	— 1,696,800	—	—	—	—
	Canadian Pacific	17,037	21.4.46	972,600	— 225,400	16	17,256,600	18,263,800	— 1,007,200	Ord. Stk.	24	14⅜	24
Various	Barsi Light†	202	Feb., 1946	30,465	+ 10,365	45	278,032	243,082	+ 34,950	Ord. Stk.	131	123	111
	Beira	204	Feb., 1946	63,146	— 9,155	20	337,628	386,578	— 48,950	—	—	—	—
	Egyptian Delta	607	31.3.46	17,943	— 2,091	52	629,877	705,057	— 75,180	Prf. Sh.	10	8½	6
	Manila	—	—	—	—	—	—	—	—	B. Deb.	71	55½	71½
	Mid. of W. Australia	277	Feb., 1946	15,858	+ 464	32	134,118	155,340	— 21,222	Inc. Deb.	97½	85	75
	Nigeria	1,900	Feb., 1946	350,919	— 35,117	46	3,153,983	3,515,685	— 361,702	—	—	—	—
	Rhodesia	2,445	Feb., 1946	466,118	+ 8,293	20	2,476,064	2,526,805	— 50,021	—	—	—	—
	South African	13,301	6.4.46	1,088,441	+ 128,532	1	1,035,894	902,733	+ 133,161	—	—	—	—
	Victoria	4,774	Jan., 1946	1,204,720	— 75,151	—	—	—	—	—	—	—	—

Receipts are calculated @ 1s. 6d. to the rupee